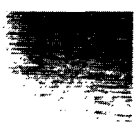
STATE OF CALIFORNIA

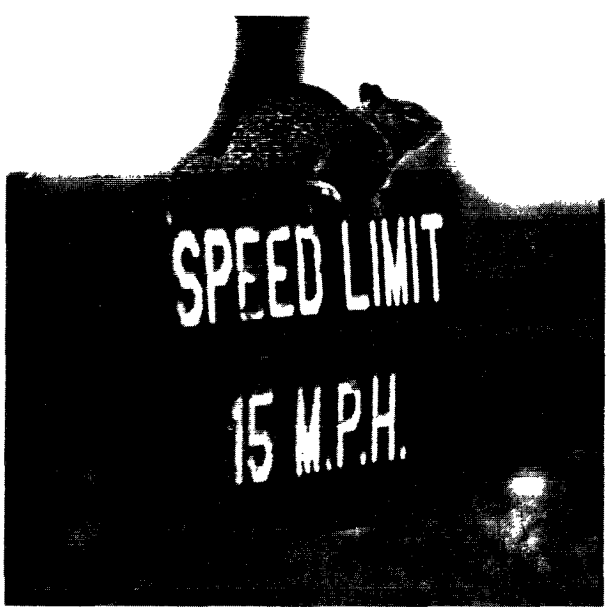
THE RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

NORTHERN DISTRICT

SACRAMENTO RIVER RECREATION SURVEY - 1980





AUGUST 1982

C-069282

C-069282

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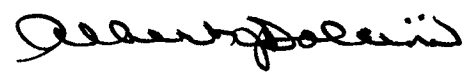
FOREWORD

Below Keswick Dam, the Sacramento River meanders through many miles of rich farmland, interrupted by occasional valley towns and stands of native vegetation. The river provides abundant habitat for many species of wildlife. Combined with diversions from the Trinity River Project, it provides the State with much of its total water supply. In 1980, some two million people enjoyed recreation on the river. Because the Sacramento serves such a wide range of uses, this leads to frequent conflicts.

The purpose of this survey was to assess the recreational use of the river and to provide a basis for evaluating the impact of water management and development proposals.

Maintenance of a reasonable balance between the river's remaining natural beauty and the competing needs of river users calls for thorough investigation and prudent planning. This report will assist in this endeavor.



Albert J. Dolcini, Chief
Northern District

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SUMMARY

A survey of recreation use was conducted during 1980 along the Sacramento River between Keswick Dam and the community of Courtland. The survey consisted of counts of recreationists from airplanes or vehicles and interviews of recreationists that provided information on levels of use, activities, length of stay, visitor residence, fish caught, and other data. This survey updated similar information collected in 1973.

An estimated 4.8 million hours of recreation (2 million recreation days) were spent on the river during 1980, about 24 percent more than in 1973. Fishing was again the predominant activity (39 percent of the total hours), with other major activities including relaxing (17 percent), power boating/water skiing (11 percent), swimming/beach use (9 percent), picnicking (6 percent), nonpower boating (5 percent), camping (5 percent), excursions/special events (3 percent), outdoor games/sports (2 percent), and miscellaneous other activities (2 percent).

Fishing totaled nearly 1.9 million hours with an estimated catch of 215,000 fish including 23 species. About 35 percent of the fish caught were catfish, 29 percent striped bass, 10 percent American shad, 8 percent rainbow trout/steelhead, 6 percent sunfish, 5 percent chinook salmon, 4 percent largemouth/smallmouth bass, 2 percent nongame species, and 1 percent sturgeon.

Sacramento River recreation was local in nature; 77 percent of the visitors lived in the 8 counties adjacent to the river (Shasta, Tehama, Glenn, Butte, Colusa, Sutter, Yolo, and Sacramento). The remaining visitors came from California's other counties and several other states and countries.

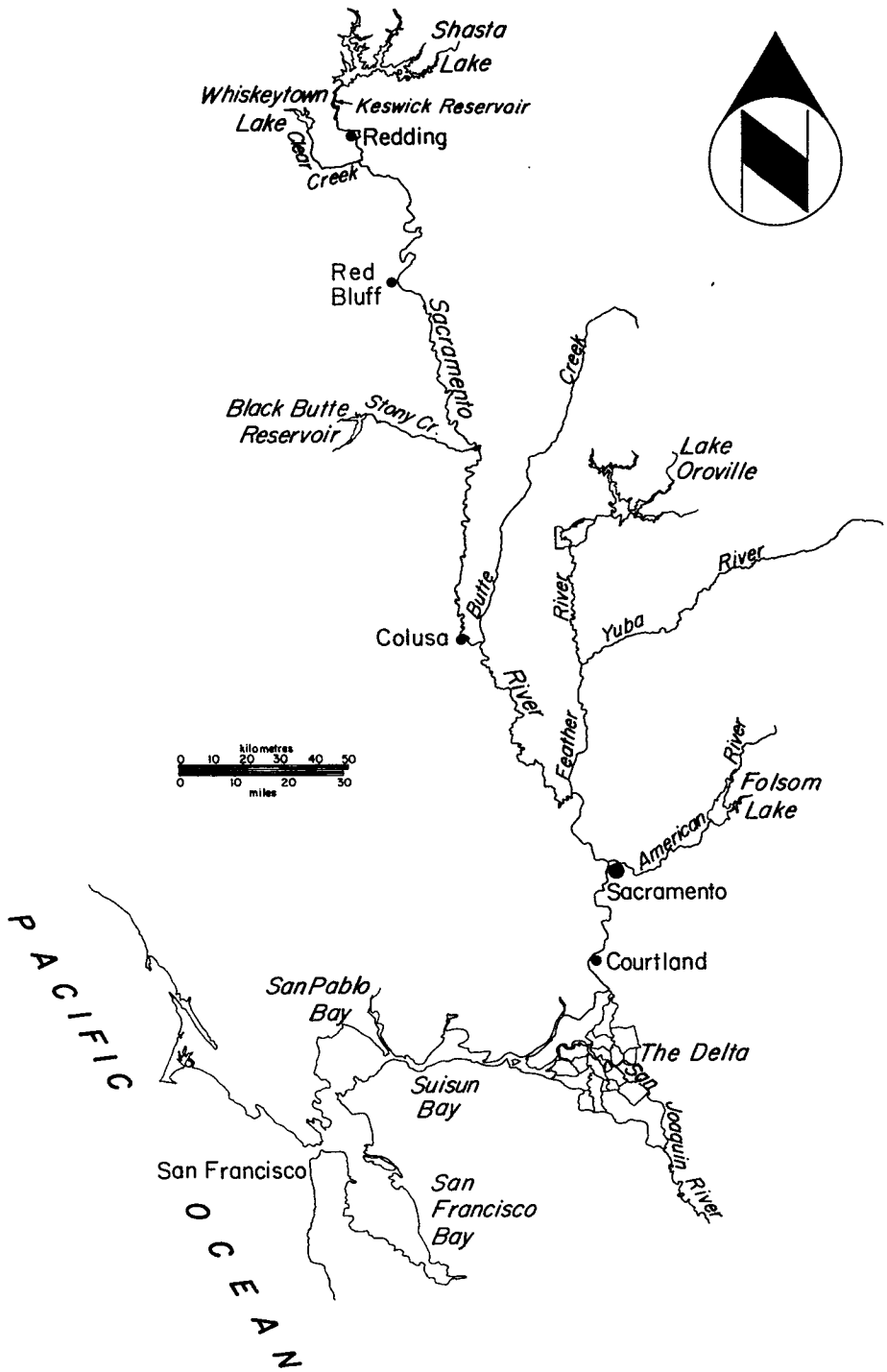

Figure 1 The Sacramento River System

GENERAL DESCRIPTION

California's largest river, the Sacramento, flows some 480 km (300 miles) from Shasta and Keswick Reservoirs to the Delta, where it meets the San Joaquin River (Figure 1).

The hot, dry days of summer in the Sacramento Valley invite rafting, tubing, skiing and swimming. Typical water temperatures range from a chilly 10° C (51° F) in the upper reaches to a pleasant 20° C (68° F) in the lower reaches. The wet, cool days of winter end water contact sports, and water temperatures drop to 9° C (48° F). Fishing remains popular throughout the year.

The river runs fast and clear from Redding to Colusa, flowing between banks matted with vegetation, and occasionally encountering bluffs, sandbars and orchards. The lower stretch of the river is more altered by human activities and natural vegetation gives way to levees and orchards. The river slows and becomes increasingly muddy as it flows through flatlands.

Land use along the river is primarily agricultural, although there are several urbanized areas. Redding, Anderson, and Red Bluff are rapidly changing to accommodate urban, suburban, and industrial needs. Riparian lands have been increasingly developed for orchards and other crops. Riverside land is mostly in private ownership, with a small amount of Federal, State, and municipal property.

Waterside vegetation is dominated by sycamore, cottonwood, black walnut, and oak trees. Wildlife includes deer, rabbit, badger, coyote, mink, raccoon, river otter, and beaver. Among the many bird species are mourning dove, great blue heron, California valley quail, acorn woodpecker, great egret, and numerous songbirds. Fish include chinook salmon, striped bass, steelhead trout, sturgeon, rainbow trout, smallmouth bass, American shad, catfish, Sacramento squawfish, and bluegill.

Scattered along the river there are fishing resorts, mobile home parks, public parks, boat ramps, and various access sites to accommodate recreationists.

INTRODUCTION

During 1980, the Department of Water Resources conducted a survey of recreation use along the Sacramento River between Keswick Dam and Courtland, a total distance of 433 km (269 mi). The survey was made using aerial counts of recreationists supplemented by ground-level counts in heavily used areas above the mouth of the Feather River, and ground-level counts alone along the lower river. Recreationists were also interviewed to obtain additional detailed information.

The Department conducted a similar survey in 1973 (Cartier, 1979), with assistance from the U. S. Army Corps of Engineers. The Department survey covered the river from Keswick Dam to Butte Creek near Colusa and showed that people spent an estimated 1,815,000 hours or 695,000 recreation days[1/] on the upper river that year. The Corps survey supplemented DWR's and covered the river from Butte Slough to the City of Sacramento. Based on information from both surveys, people spent about 2,500,000 hours or 900,000 recreation days on the river in 1973.

Current knowledge of river recreation is needed to properly manage use of the river and to assess the impacts of water management and/or development proposals.

Appendix A describes the 13 river reaches used in the 1980 recreation survey. Appendix B lists recreation access sites and facilities along the river between Keswick Dam and the community of Courtland. Appendices C to F provide details of the survey schedule and methods.

1/ A recreation hour is one hour of participation in any recreation activity by one person; a recreation day is participation by one person for all or part of a day.

METHODS

This Sacramento River recreation survey included counts of recreationists using the river, interviews with individual recreationists, and creel census of anglers. The use counts provided estimates of hours of daytime use by activity. The interviews provided information on recreation activities and other visitor characteristics. The creel census provided data on fishing success.

Counts of Recreationists

Counts of recreation use were made on 33 days during 1980. Use count days were randomly selected within nine survey strata, using the optimum allocation method described by Abrahamson and Tolladay (1959). Each stratum represented a portion of the year with similar use levels and activities (Table 1).

TABLE 1

SACRAMENTO RIVER RECREATION SURVEY STRATA - 1980

Stratum Number	Period of Year Included in Stratum	Number of Days in Stratum	Number of Days Surveyed
1	November 1-February 29, weekdays	83	2
2	November 1-February 29, weekends and holidays	38	2
3	March 1-April 30, weekdays	43	3
4	March 1-April 30, weekends and holidays	18	3
5	May 1-September 1, weekdays	85	7
6	May 1-September 1, weekends except holiday weekends	30	7
7	September 2-October 31, weekdays	43	3
8	September 2-October 31, weekends and holidays	17	3
9	May 1-September 1, holiday weekends	9	3
	Totals	366	33

Five use counts were made on each survey day by surveyors driving along the river reaches. The use counts were scheduled at regular intervals, based on the number of daylight hours. The number of recreationists, their vehicles and boats were recorded by recreational activity and river reach. On 31 days two use counts were made by airplane at the same time of day as the second and fourth car counts. On two days only car counts were made because bad weather made flying impossible. The aerial counts covered survey reaches 1-10 (Keswick Dam to the mouth of the Feather River) (Table 2). The car counts were conducted in all reaches except 5, 7, and 9, where public access was limited and use was relatively low.

TABLE 2

DESCRIPTION OF SACRAMENTO RIVER
RECREATION SURVEY REACHES[1/]

Reach	Description	River Kilometres	River Miles
1	Keswick Dam to North Street Bridge in Anderson	29	18
2	North Street Bridge to Jellys Ferry Bridge	27	17
3	Jellys Ferry Bridge to Red Bluff Diversion Dam	39	24
4	Red Bluff Diversion Dam to Woodson Bridge (South Avenue)	40	25
5	Woodson Bridge to Hamilton City Bridge	31	19
6	Hamilton City Bridge to Sidds Landing north of Glenn	34	21
7	Sidds Landing to Hamilton Bend	46	29
8	Hamilton Bend to Meridian Bridge	24	15
9	Meridian Bridge to Eldorado Bend	57	35
10	Eldorado Bend to mouth of the Feather River	30	19
11	Feather River to north end of Discovery Park	32	20
12	Discovery Park to south end of Miller Park	5	3
13	Miller Park to Paintersville Bridge below Courtland	39	24
	Totals	433	269

1/ See Appendix A for detailed description.

Estimated hours of recreation use in reaches 1-10 for each survey day were calculated by expanding the aerial counts, using the proportions of use observed during the five car counts. Thus, if 40 percent of a day's use was observed in the second and fourth ground counts, we assumed that the aerial counts also included 40 percent of the day's use. Aerial counts for reaches 5, 7, and 9 were expanded based on the car counts in the adjacent reaches (6, 8, and 10). Estimated hours of use for reaches 11-13 were determined by expanding ground counts to include the daylight hours. The daily use totals were then expanded to provide an estimate for each stratum. Adding the stratum totals provided an estimate of recreation hours for the year. To estimate recreation days, total recreation hours were divided by a weighted mean length of stay. The harmonic mean was used rather than the arithmetic mean to correct for the higher probability of interviewing people on lengthy visits (Lucas, 1963). The harmonic mean is simply a way to correct a statistical bias otherwise built into surveys of this type.

Interviews

Recreationists on the Sacramento River were contacted throughout the day. The interviewer attempted to include a cross-section of activities. Information obtained from each person included county of residence, recreation activities, overnight accommodations, number of people per vehicle, and length of stay. The interview data were checked for accuracy, entered into a computer data file, and summarized using a program developed for this study.

The interviews gave somewhat different information on activities than the counts of recreationists because they reflected what people intended to do rather than what we actually saw them do. Also, the counts of recreationists indicated the total hours spent on a particular activity rather than the number of people planning to participate. People spent many hours participating in some activities (e.g., boat fishing, camping, canoeing), a moderate number of hours on others (shore fishing, pleasure boating, relaxing) and relatively few hours on a few activities (bicycling, swimming, beach use, picnicking). Together, the counts and interviews gave a good picture of what people were doing.

Activity days, another measure of recreation use used to define facility needs, can be derived from these estimates by multiplying recreation days by the activity percentages from the interviews.

Creel Census

Anglers fishing the Sacramento River were contacted on the 33 scheduled survey days and on a few additional days to determine fishing success. County of residence and length of time spent fishing so far that day were recorded for each angler. Fish caught were counted, measured (fork length to nearest 0.5 cm), and identified by species.

Estimated catch of a few species was determined by multiplying the catch per hour for each species by the estimated angler hours for the species in each river reach and each survey stratum. For most species, it

was not possible to separate hours fished for each species because of similar fishing methods and seasons. The estimated catch for these species was determined by the formula: Catch of a given species = $\frac{S}{T}EC$, where S is the number of fish of a given species observed in the creel census, T is the total number of all fish observed in the creel census, E is the total estimated angler hours, and C is the catch per hour for all fish (Puckett, 1975).

During the creel census, a number of undersized striped bass were observed in anglers' catches. Some were only 10-15 cm (4-6 in) in length. Anglers kept these small fish (minimum legal limit size is 40.6 cm--16 in) either because they didn't know the law or because the fish were hooked deeply and died. These small striped bass were included in the creel census results if anglers kept the fish, illegal or not. If anglers released the fish, we did not include them in the results. About 23 percent of the censused striped bass were undersize. The minimum size limit for sturgeon was 101.6 cm (40 in). All of the sturgeon observed in the census were larger than the legal minimum.

There was no minimum size limit for other species observed in the 1980 census. Other species (i.e., carp, squawfish, splittail, hitch, etc.) were included in the results if anglers kept the fish, even if it was later thrown away.

We did not attempt to differentiate between rainbow trout or steelhead in this survey. The Department of Fish and Game usually considers any Sacramento River rainbow trout over 356 mm (14 in) a steelhead. About 23 percent of the censused rainbow trout/steelhead were steelhead by this criterion.

We also lumped several species of sunfish (bluegill, redear, green sunfish, black and white crappie), several species of catfish (white catfish, channel catfish, brown bullhead, black bullhead), several nongame species (suckers, squawfish, hitch, hardhead splittail, carp), and largemouth and smallmouth bass.

OVERVIEW OF RESULTS

Estimated Recreation Use

Overall, recreation use on the Sacramento River between Keswick Dam and Courtland totaled 4.8 million hours (2 million recreation days) in 1980. Fishing was the predominant activity with 39 percent of the total hours (23 percent boat fishing, 16 percent shore fishing). Relaxing, usually by people in city and county parks along the river, was a distant second with about 17 percent of the total hours of recreation. Fishing was the primary activity everywhere except near Redding, Red Bluff, and Sacramento, where relaxing was the predominant activity.

Other major recreation activities included power boating/water skiing (11 percent), swimming/beach use (9 percent), picnicking (6 percent), nonpower boating (5 percent), camping (5 percent), excursions/special events (3 percent), outdoor games/sports (2 percent), and miscellaneous other activities (2 percent). In all, more than 100 different recreation activities were observed and combined into 20 activity categories (Tables 3 and 4).

Interview Data and Visitor Characteristics

We conducted 3,706 interviews representing 9,574 people who visited the Sacramento River for recreation. About 88 percent considered the Sacramento River the destination for their visit, 8 percent had stopped briefly while enroute elsewhere, and 4 percent were staying nearby. Seventy-six percent of the people interviewed came to the river for day use, the remaining 24 percent stayed overnight at the river or nearby.

In general, Sacramento River recreation was predominantly in nature, and 77 percent of the visitors lived in the eight counties adjacent to the river (Shasta, Tehama, Glenn, Butte, Colusa, Sutter, Yolo, and Sacramento). The remaining 23 percent of the visitors came from most of California's other counties and several other states and countries. Each of these other locations provided less than 3 percent of the river visitors (Figure 2).

The average length of stay for those staying overnight at the river was 3.8 days, and 5.0 days for those staying nearby in the area. Day use visitors averaged 3.5 hours at the river.

Most of the overnight visitors stayed at public parks or campgrounds (54 percent). The second largest category included those who camped at undeveloped sites along the river (22 percent), while 10 percent stayed with friends or relatives, 9 percent stayed at private campgrounds, 4 percent at resorts or motels, and 1 percent at private summer homes or cabins.

People camping at the river used a variety of overnight accommodations. About 24 percent stayed in travel trailers, 23 percent in pickup campers, 19 percent in motor homes, vans or buses, 18 percent in tents, 13 percent in the open or in a boat or car, and 3 percent in tent trailers.

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TABLE 3

ACTIVITY CLASSIFICATION, SACRAMENTO RIVER, 1980

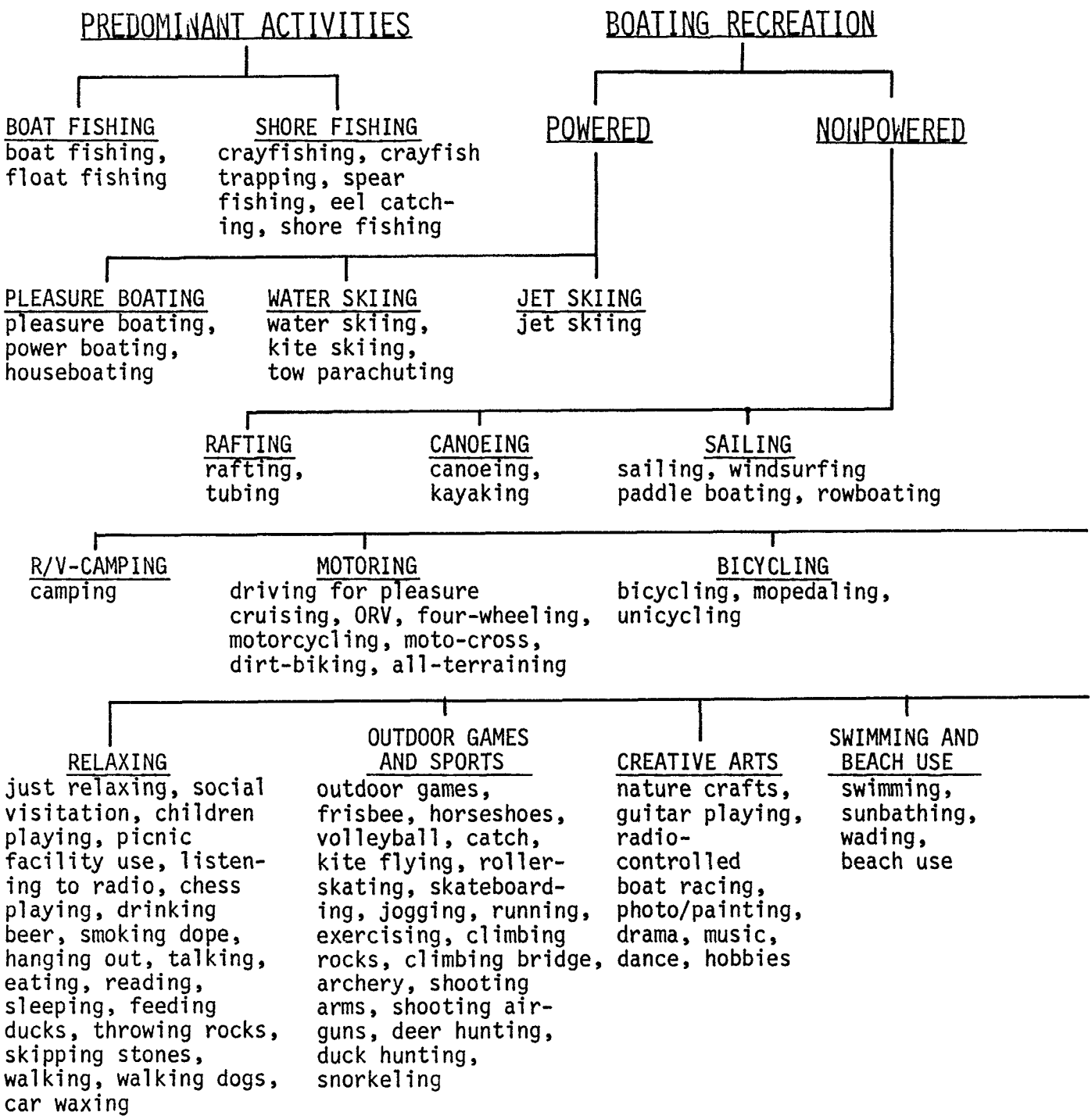


TABLE 3 (cont.)

ACTIVITY CLASSIFICATION, SACRAMENTO RIVER, 1980

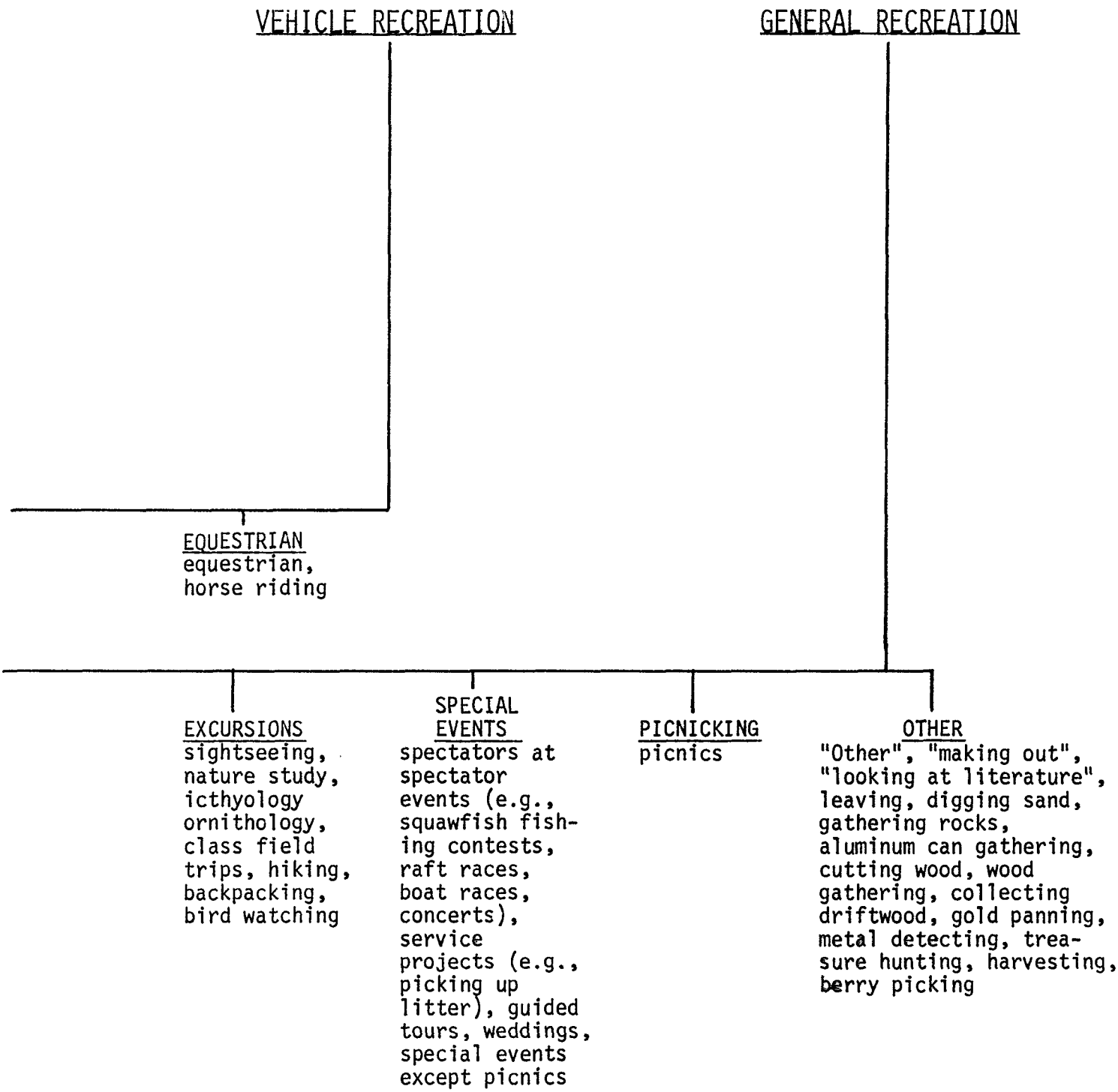


TABLE 4

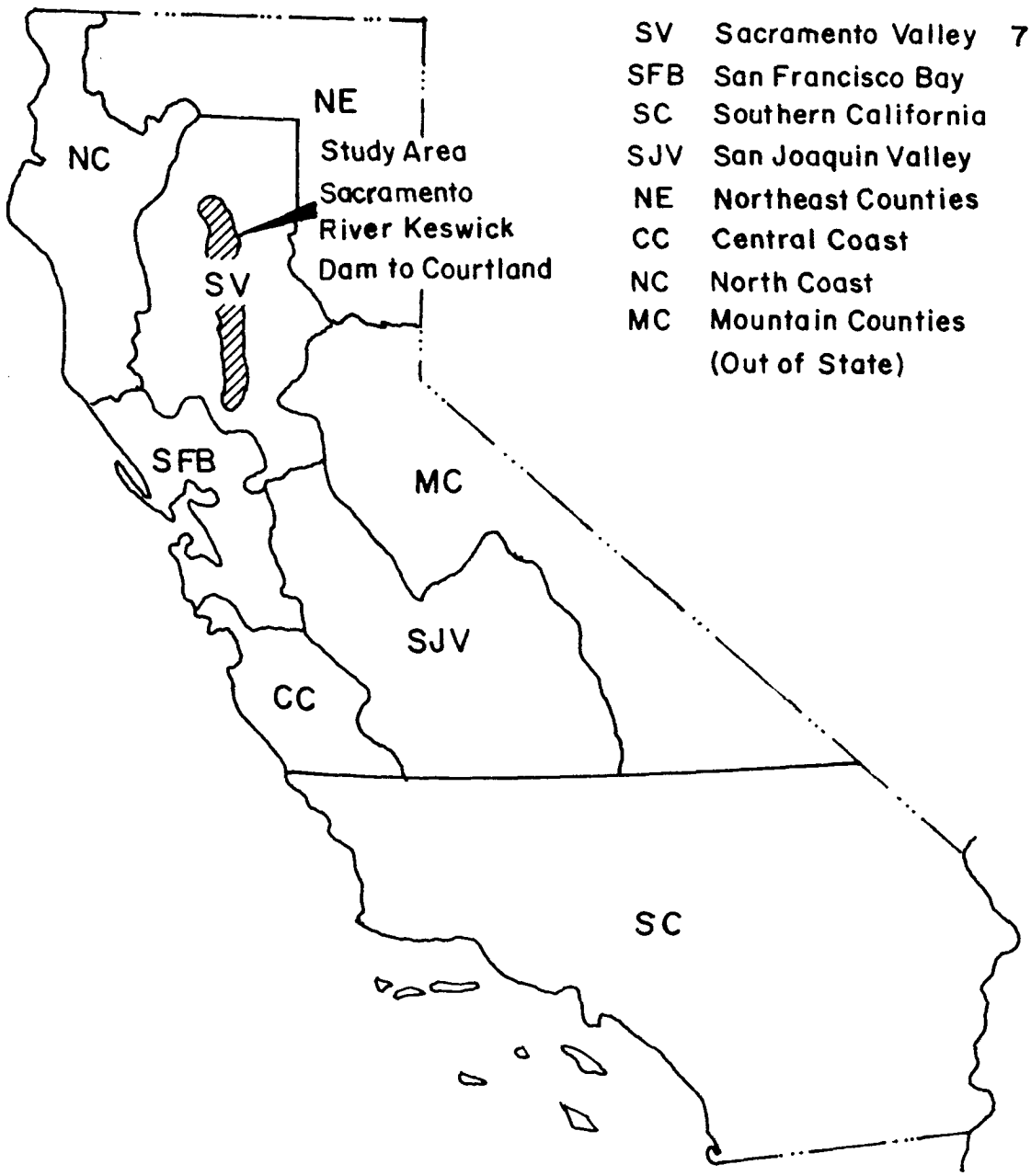
ESTIMATED RECREATION HOURS BY RIVER REACH AND ACTIVITY
SACRAMENTO RIVER, 1980

River Reach	Boat Fishing	Shore Fishing	Jet Skiing/ Sailing	Pleasure Boating	Water Skiing	Rafting/ Tubing	Canoeing	Equestrian	RV/Camping
1	23,000	36,000	200	2,000		42,000	16,000	800	5,000
2	62,000	49,000		2,000		4,500	23,500	1,000	34,500
3	34,000	25,000	500	33,000	4,000	17,500	12,500	500	21,000
4	85,000	47,000		3,000		3,500	10,500	300	46,500
5	15,000	2,000		300		1,000	2,500		100
6	22,000	42,000		3,000	100	94,600	3,000		3,000
7	43,000	15,000		700	100	3,000	9,000		600
8	145,000	34,000		11,000	2,500	3,000	2,500	100	54,000
9	80,000	46,000		20,000	6,000	1,300	1,000		9,000
10	60,000	130,000	500	59,000	14,000	600	3,500	100	40,000
11	135,000	45,000	1,100	90,000	20,000	200	500	100	11,000
12	122,000	105,000	3,500	118,000	7,000	2,000	300	200	7,000
13	289,000	199,000	1,200	132,000	13,000	800	200	200	17,000
TOTALS	1,115,000	775,000	7,000	474,000	66,700	174,000	85,000	3,300	248,700

TABLE 4 (cont.)

ESTIMATED RECREATION HOURS BY RIVER REACH AND ACTIVITY
SACRAMENTO RIVER, 1980

Motoring	Bicycling	Relaxing	Outdoor Games/Sports Creative Arts	Swimming, Beach Use	Excursions/ Special Events	Picnicking	Other	TOTAL HOURS	RECREATION DAYS
2,000	2,000	150,000	28,000	31,000	30,000	25,000	12,000	405,000	242,000
1,000	3,000	59,000	8,500	10,000	8,000	53,000	4,000	323,000	160,000
1,000	2,500	95,000	8,000	19,500	37,000	33,000	4,000	348,000	200,000
500	2,500	60,000	10,000	27,000	8,000	42,000	1,200	347,000	137,000
200		500		1,200	200			23,000	9,000
300	2,000	26,000	1,000	10,000	6,000	8,000	2,000	223,000	94,000
500		1,400		5,300	1,000		1,400	81,000	28,000
500	1,500	29,000	1,000	31,000	3,000	11,000	5,900	335,000	115,000
200	100	6,000	600	30,000	1,300		3,500	205,000	68,000
1,000	300	32,000		74,500	4,000	500	10,000	430,000	134,000
2,300	2,000	30,000	2,000	45,000	3,700	12,000	100	400,000	128,000
4,000	16,000	280,000	37,000	112,000	20,000	103,000	3,000	940,000	427,000
2,500	5,000	32,000	2,700	40,000	4,000	1,000	400	740,000	258,000
16,000	36,900	800,900	98,800	436,500	126,200	288,500	47,500	4,800,000	2,000,000



SV	Sacramento Valley	77%
SFB	San Francisco Bay	9%
SC	Southern California	5%
SJV	San Joaquin Valley	1.5%
NE	Northeast Counties	0.5%
CC	Central Coast	0.5%
NC	North Coast	0.5%
MC	Mountain Counties	2%
	(Out of State)	4%

Figure 2
VISITOR ORIGIN, SACRAMENTO RIVER, 1980
N=9,545

The interviews revealed that more people planned to "relax" than any other activity (56 percent of the people interviewed). The second most popular activity was fishing (43 percent), followed by swimming/beach use (32 percent), picnicking (23 percent), camping (23 percent), pleasure boating (19 percent), excursions/special events (13 percent), and water skiing (9 percent). Minor activities included bicycling (2 percent), outdoor/games/sports (2 percent), motorcycling (1 percent), and horseback riding (1 percent). These percentages add up to 224 percent because many people planned to take part in two or more activities.

Most people who planned to boat used power boats (67 percent) and often also planned to water ski. About 19 percent of the boaters were rafting or tubing, 10 percent canoeing or kayaking, 2 percent houseboating, and 2 percent jet skiing or sailing.

Most boats used on the Sacramento River were power boats, usually trailered (78 percent). We only interviewed a few people using rental boats (2 percent) and moored boats (2 percent). However, we probably did not contact many people using rental or moored boats, since they tended to use private docks we could not always reach. About 9 percent of the boaters had rafts or other inflatables and 9 percent had canoes, kayaks, or sailboats.

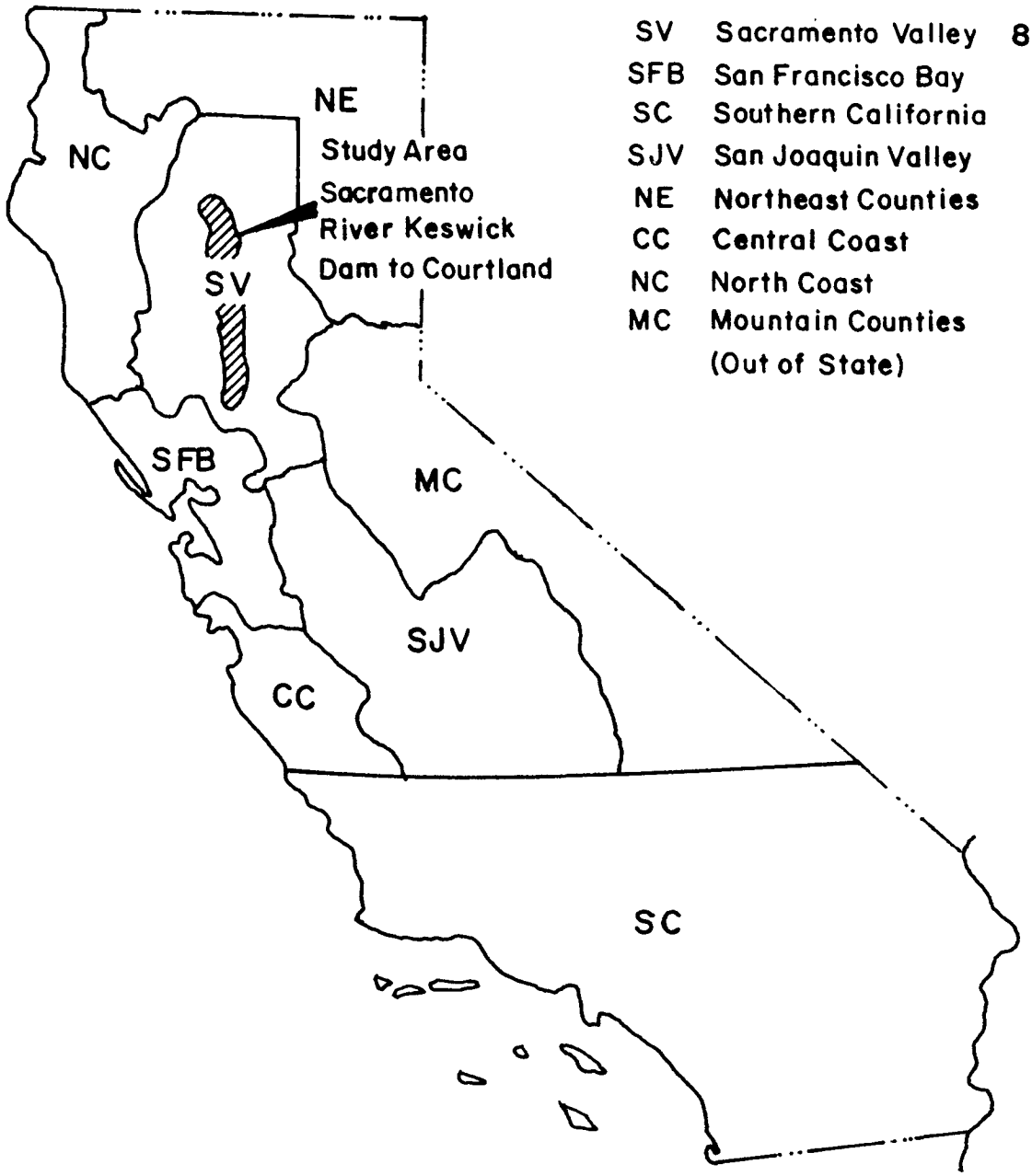
The most common special equipment recreationists had were bicycles (68 percent), followed by motor bikes (19 percent), all-terrain vehicles (7 percent), and miscellaneous other equipment (6 percent).

Creel Census Data

Shore anglers mostly fished for anything they could catch (42 percent). They specifically sought striped bass (20 percent), catfish (14 percent), salmon (10 percent), steelhead (9 percent), trout (8 percent), American shad (7 percent), sturgeon (7 percent), large or smallmouth bass (4 percent), and miscellaneous other species (3 percent).

Boat anglers were apparently more serious fishermen. About 35 percent fished for striped bass, 32 percent for salmon, while only 26 percent fished for anything they could catch. Other species sought included catfish (9 percent), steelhead (8 percent), trout (8 percent), American shad (6 percent), sturgeon (5 percent), large or smallmouth bass (5 percent), and miscellaneous other species (less than 1 percent). These percentages total more than 100 percent because many anglers fished for more than one species.

Sacramento River anglers came from the same areas as the general visitors but tended to be even more local in origin (Figure 3).



SV	Sacramento Valley	84%
SFB	San Francisco Bay	7.5%
SC	Southern California	2.5%
SJV	San Joaquin Valley	2%
NE	Northeast Counties	0.5%
CC	Central Coast	0.5%
NC	North Coast	—
MC	Mountain Counties	2%
	(Out of State)	1%

Figure 3
ANGLER ORIGIN, SACRAMENTO RIVER, 1980
N=3,066

Fishing totaled 1,890,000 angler hours, 59 percent by boat fishermen, 41 percent by shore anglers. Different species of fish were caught in various areas of the river, the predominant species being rainbow trout in upper reaches near Redding and striped bass and catfish in middle reaches near Colusa and in lower reaches below Sacramento. Overall, about 35 percent of the fish caught were catfish, 29 percent striped bass, 10 percent American shad, 8 percent rainbow trout/steelhead, 6 percent sunfish, 5 percent chinook salmon, 4 percent large or smallmouth bass, 2 percent nongame fishes, and 1 percent sturgeon (Tables 5, 6, and 7). Anglers caught an estimated 225,000 fish including 23 different species (Table 8).

TABLE 5

ESTIMATED CATCH BY SPECIES
SACRAMENTO RIVER, 1980

Species	Estimated Catch	Percent
Catfish (Channel Catfish, White Catfish, Brown Bullhead, Black Bullhead)	78,500	35
Striped Bass	66,100	29
American Shad	22,700	10
Rainbow Trout/Steelhead	18,800	8
Sunfish (Bluegill, Redear, Green Sunfish, White Crappie, Black Crappie)	14,100	6
Chinook Salmon	11,000	5
Largemouth Bass/Smallmouth Bass	8,700	4
Nongame Species (Sacramento Sucker, Hardhead, Sacramento Squawfish, Hitch, Sacramento Splittail, Carp	3,300	2
Sturgeon (White Sturgeon)	1,800	1
Total	225,000	100

The census clerks measured over 800 angler-caught fish during the survey. The size of fish caught varied widely by species (Table 9). The largest fish measured were sturgeon (not shown in Table 9), all of which were more than 1 160 mm (45.7 in) in length. Chinook salmon and striped bass were also among the largest fish caught; bluegill, green sunfish, and crappie were the smallest, with the other species intermediate in size.

TABLE 6

SHORE ANGLER USE AND CATCH, SACRAMENTO RIVER, 1980

River Reach	Estimated Angler Hours	ESTIMATED CATCH									
		Catfish	Striped Bass	American Shad	Rainbow Trout/ Steelhead	Sunfish	Chinook Salmon	Largemouth or Smallmouth Bass	Non-game Fish	Sturgeon	Total Catch
1	36,000				1,400				100		1,500
2	49,000	100			2,900	7,500	100	300	500		11,400
3	25,000				3,000				600		3,600
4	47,000	200	400	900	1,000	100		1,200	300		4,100
5	2,000	50			100			50			200
6	42,000	3,400		1,500	100	3,000	200	700	300		9.200
7	15,000	1,300	500			200	100	300			2,400
8	34,000	3,450	900			900	300	1,150		100	6,800
9	46,000	4,100	1,000			600	100	400		200	6,400
10	130,000	14,200	1,000		100	800		100		300	16,500
11	45,000	100	300	3,100	100		100		300		4,000
12	105,000	500	3,300		100	100		700	700		5,400
13	199,000	29,000	6,800	5,500				1,200	500		43,000
Totals	775,000	56,400	14,200	11,000	8,800	13,200	900	6,100	3,300	600	114,500

TABLE 7

BOAT ANGLER USE AND CATCH, SACRAMENTO RIVER, 1980

River Reach	Estimated Angler Hours	ESTIMATED CATCH									
		Catfish	Striped Bass	American Shad	Rainbow Trout/ Steelhead	Sunfish	Chinook Salmon	Largemouth or Smallmouth Bass	Non-game Fish	Sturgeon	Total Catch
1	23,000				3,600						3,600
2	62,000				2,400		1,500	1,100			5,000
3	34,000				1,700		300	100			2,100
4	85,000			8,600			1,800				10,400
5	15,000			1,500			300				1,800
6	22,000	300		300		300		500			1,400
7	43,000	1,700	4,400			100	700			200	7,100
8	145,000	5,100	17,400			400	2,200			500	25,600
9	80,000	2,400	8,400			100	1,000			300	12,200
10	60,000	600	1,800								2,400
11	135,000	5,900	2,200	1,300	1,900		200	900		200	12,600
12	122,000	5,200	500		400		1,200	1,200			7,300
13	289,000	900	17,200				900				19,000
Totals	1,115,000	22,100	51,900	11,700	10,000	900	10,100	2,600	0	1,200	110,500

TABLE 8

FISHES OF THE SACRAMENTO RIVER[1/]

	Anadromous Fishes	Observed in 1980 Creel Census
Pacific Lamprey	Lampetra tridentata	
River Lamprey	Lampetra ayresi	
White Sturgeon	Acipenser transmontanus	X
Green Sturgeon	Acipenser medirostris	
American Shad	Alosa sapidissima	X
Pink Salmon	Oncorhynchus gorbuscha	
Chum Salmon	Oncorhynchus keta	
Coho Salmon	Oncorhynchus kisutch	
Chinook Salmon	Oncorhynchus tschawytscha	X
Sockeye Salmon	Oncorhynchus nerka	
Steelhead Trout	Salmo gairdneri	X
Striped Bass	Morone saxatilis	X
	Resident Fishes	
Brook Lamprey	Lampetra pacifica	
Threadfin Shad	Dorosoma petenense	
Delta Smolt	Hypomesus transpacificus	
Longfin Smolt	Spirinchus thaleichthys	
Kokanee	Oncorhynchus nerka	
Brown Trout	Salmo trutta	
Rainbow Trout	Salmo gairdneri	X
Carp	Cyprinus carpio	X
Goldfish	Carassius auratus	
Golden Shiner	Notemigonus crysoleucas	
Sacramento Blackfish	Orthodon microlepidotus	
Hardhead	Mylopharodon conocephalus	X
Hitch	Lavinia exilicauda	X
Sacramento Squawfish	Ptychocheilus grandis	X
Sacramento Splittail	Pogonichthys macrolepidotus	X
California Roach	Hesperoleucus symmetricus	
Speckled Dace	Rhinichthys osculus	
Sacramento Sucker	Catostomus occidentalis	X
Channel Catfish	Ictalurus punctatus	X
White Catfish	Ictalurus catus	X
Brown Bullhead	Ictalurus nebulosus	X
Black Bullhead	Ictalurus melas	X
Mosquitofish	Gambusia affinis	
Mississippi Silverside	Menidia audens	
Threespine Stickleback	Gasterosteus aculeatus	
Sacramento Perch	Archoplites interruptus	
Black Crappie	Pomoxis nigromaculatus	X
White Crappie	Pomoxis annularis	X
Warmouth	Lepomis gulosus	
Green Sunfish	Lepomis cyanellus	X
Bluegill	Lepomis macrochirus	X
Pumpkinseed	Lepomis gibbosus	
Redear Sunfish	Lepomis microlophus	X
Largemouth Bass	Micropterus salmoides	X
Spotted Bass	Micropterus punctatus	
Smallmouth Bass	Micropterus dolomieui	X
Yellow Perch	Perca flavescens	
Bigscale Logperch	Percina macrolepida	
Tule Perch	Hysterocarpus traski	
Coastrange Sculpin	Cottus aleuticus	
Prickly Sculpin	Cottus asper	
Riffle Sculpin	Cottus gulosus	

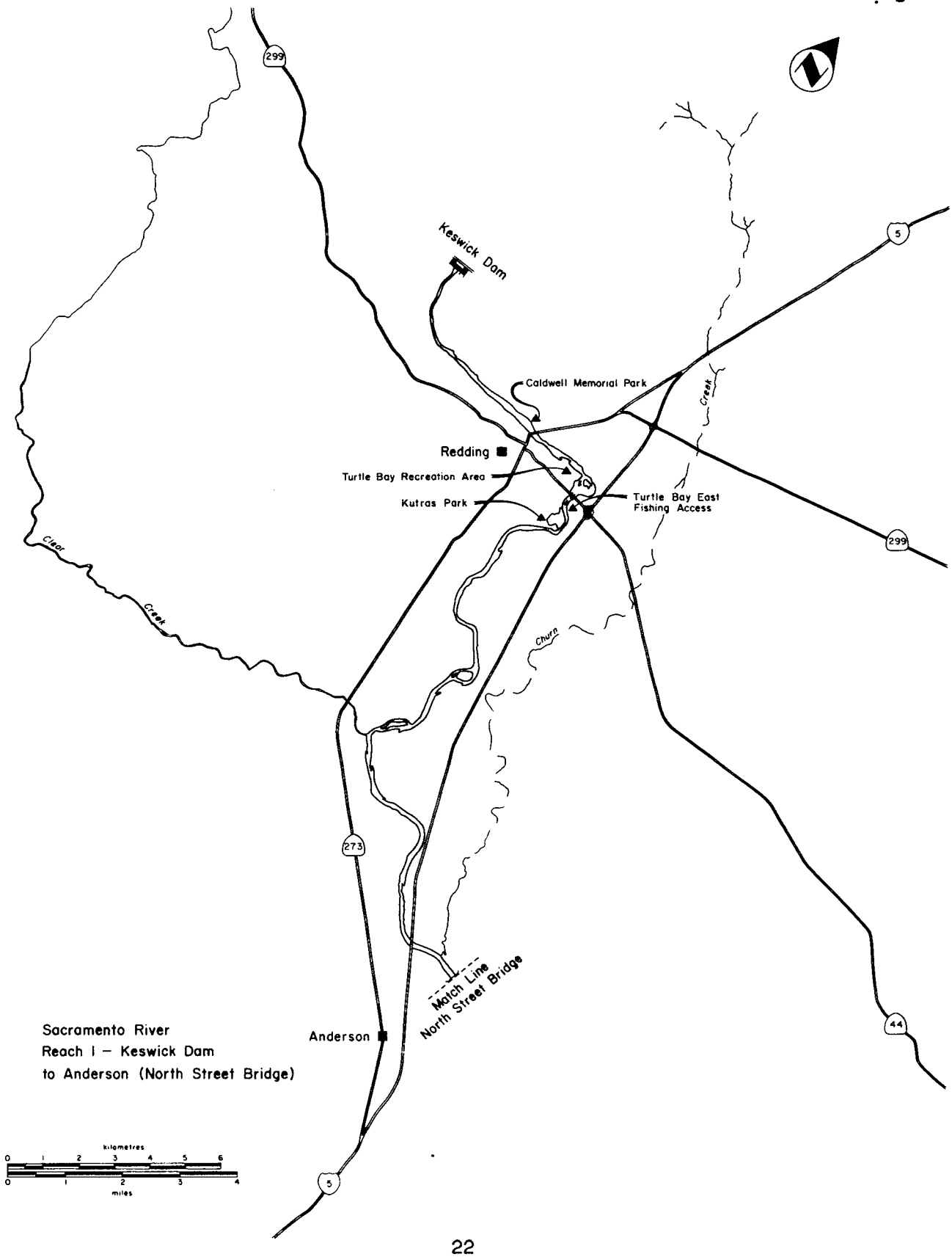
1/ From Moyle, 1976, excluding estuarine species

TABLE 9

LENGTH-FREQUENCY OF ANGLER-CAUGHT FISH,
SACRAMENTO RIVER, 1980

Length (mm)	White Catfish	Channel Catfish	Brown Bullhead	Striped Bass	American Shad	Rainbow Trout Steelhead	Chinook Salmon	Bluegill/ Redear	Green Sunfish	Black/ White Crappie	Largemouth Bass	Smallmouth Bass	Squaw-fish
80-99			2			1			1				
100-119		4	1			1		3	3				
120-139	4			4		2		17	2	1			2
140-159	10	3	2	3		3		30	2	2			1
160-179	10	1		1		5		16	3	1	2	1	1
180-199	33	3	3	4		15		12	2	2	3	2	1
200-219	37	6	5	5		14		1	2	3	3	1	2
220-239	27	6	3	4		9				1	2	4	3
240-259	12	6	5	3	5	7				1	3	2	
260-279	8		4		2	13					2	7	
280-299	6	3	1	4	5	3					6	2	1
300-319	4	10	1	1	7	7					5	2	2
320-339	2	1			9	6	1				4	1	1
340-359		3	1	2	7	4					5		1
360-379	1	2		1	4	4					3		2
380-399	1			6	6	2					2	1	1
400-419	1	5		12	7	5	1				1		
420-439		1		17	4	2					2		
440-459		3		11	4	3	1						
460-479		2		7	2	1							
480-499		2		15	1	1					2		
500-519		3		13	1	1							
520-539		4		7		1							
540-559				6	1	1							
560-579		1		12	2		2						
580-599				7			1						1
600-619		2		6			1						
620-639		1		3	1		3						
640-659				3									
660-679				1			2						
680-699				1									
700-719				2	1		1						1
720-739				1			1						
740-759							1						
760-779				4			3						
780-799													
800-819				1			2						
820-839							3						
840-859							1						
860-879							2						
880-899							3						
900-919							2						
920-939													
940-959							1						
960-979													
980-999													
1000-1019													
1020-1039													
1040-1059				1									
Total Sample	156	72	28	168	69	111	32	79	15	11	45	23	20
Average Length (mm)	214	327	219	460	373	270	727	151	149	188	303	258	291
(inches)	8.4	12.9	8.6	18.1	14.7	10.6	28.6	5.9	5.9	7.4	11.9	10.2	11.5

Figure 4



Sacramento River
Reach I – Keswick Dam
to Anderson (North Street Bridge)

RIVER REACH 1 - KESWICK DAM TO NORTH STREET BRIDGE IN ANDERSON

Estimated Recreation Use

Recreation use along the river in the Redding area totaled 405,000 hours (242,000 recreation days). By far the largest activity was relaxing at parks and other access sites along the river (37 percent of total). Other major activities included fishing (15 percent), rafting/tubing (10 percent), swimming/beach use (8 percent), excursions/special events (7 percent), outdoor games/sports (7 percent), picnicking (6 percent), and canoeing (4 percent). Reach 1 had the second highest use for rafting/tubing and canoeing of any river reach. Major recreation areas included Caldwell Memorial Park, Turtle Bay Recreation Area, and Kutras Park.

Interview Data and Visitor Characteristics

We interviewed 443 parties representing 1,009 people using the Sacramento River in the Redding area. The river was the trip destination for 85 percent of these visitors, with 9 percent stopping while enroute elsewhere and 6 percent staying in the area. About 77 percent of the upper river visitors lived in Shasta County with out-of-state visitors (7 percent) the next largest group. Day use visitors made up 88 percent of the total, and overnight visitors 12 percent.

The average length of stay for people camping overnight at the river was 4.0 days, and 4.3 days for those staying in the area. Day users spent an average of 2.4 hours at the river, with a harmonic mean of 1.7 hours (the harmonic mean corrects for the higher probability of contacting people on longer visits and is used to determine recreation days from recreation hours).

Relaxing (51 percent of the people interviewed), picnicking (34 percent), fishing (20 percent), swimming/beach use (14 percent), excursions/special events (13 percent), and boating (10 percent) were the activities people most frequently cited. Much of the recreation in this area occurred in city parks adjacent to the river.

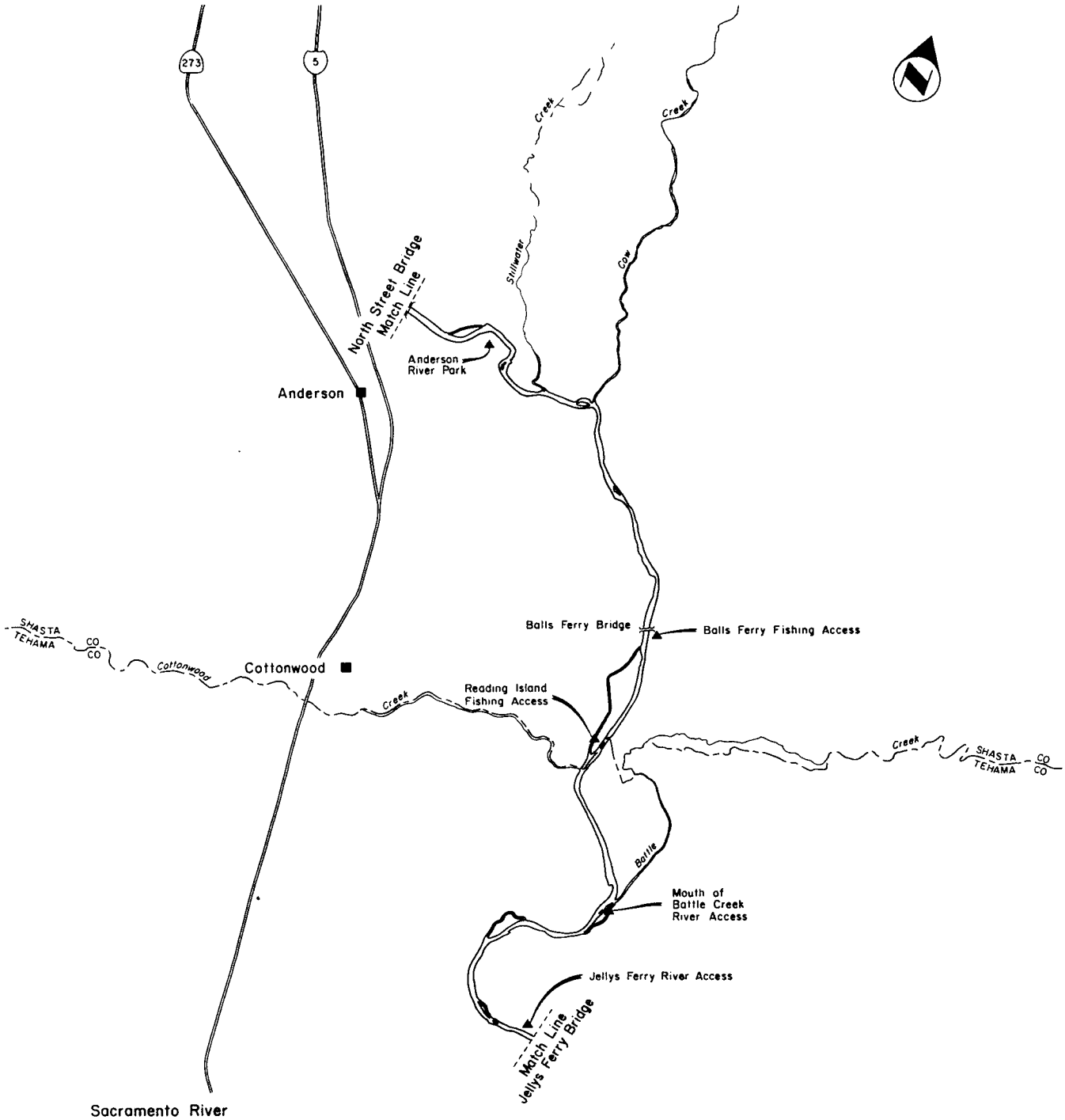
Canoeing was the most frequent type of boating in this reach with 51 percent of the boaters, followed by power boating (23 percent), rafting/tubing (23 percent), and sailing in Kutras Park (3 percent).

Creel Census Data

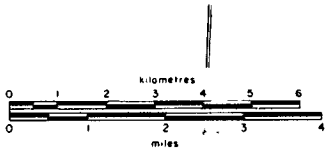
Shore anglers in the Redding area mostly sought trout (51 percent) or anything they could catch (36 percent). The remaining 13 percent sought steelhead or salmon. Shore anglers fished 36,000 hours with an estimated catch of 1,400 rainbow trout/steelhead and 100 nongame fish.

Boat anglers mostly fished for trout (67 percent) or anything (33 percent). They fished 23,000 hours with a catch of 3,600 rainbow trout/steelhead.

Figure 5



Sacramento River
Reach 2 – Anderson (North Street Bridge) to Jellys Ferry Bridge



RIVER REACH 2 - NORTH STREET BRIDGE TO JELLYS FERRY BRIDGE

Estimated Recreation Use

Recreation use of the river near Anderson totaled 323,000 hours (160,000 recreation days). Over one-third of this use was fishing (34 percent), with relaxing (18 percent), and picnicking (16 percent) also major activities. Much of this use occurred in Anderson River Park. Camping (11 percent), canoeing (7 percent), and swimming/beach use (3 percent) were also important in this reach. This river reach had more canoeing than any other, much of it starting upstream in Redding and ending at Anderson River Park or Balls Ferry Bridge. Important access sites, in addition to Anderson Park, included Balls Ferry Fishing Access, Reading Island Fishing Access, mouth of Battle Creek River Access, and Jellys Ferry River Access.

Interview Data and Visitor Characteristics

We interviewed 333 people in Reach 2 who represented 828 recreationists. The Sacramento River was the destination for 88 percent of these people, with 6 percent enroute elsewhere, and 6 percent staying overnight in the area. About 81 percent of the river visitors lived in Shasta or Tehama Counties and 78 percent were day users, with 22 percent overnight visitors.

The average length of stay for people camping overnight at the river was 4.2 days, and 3.0 days for those staying in the area. Day use visitors spent 3.0 hours at the river with a harmonic mean of 2.0 hours.

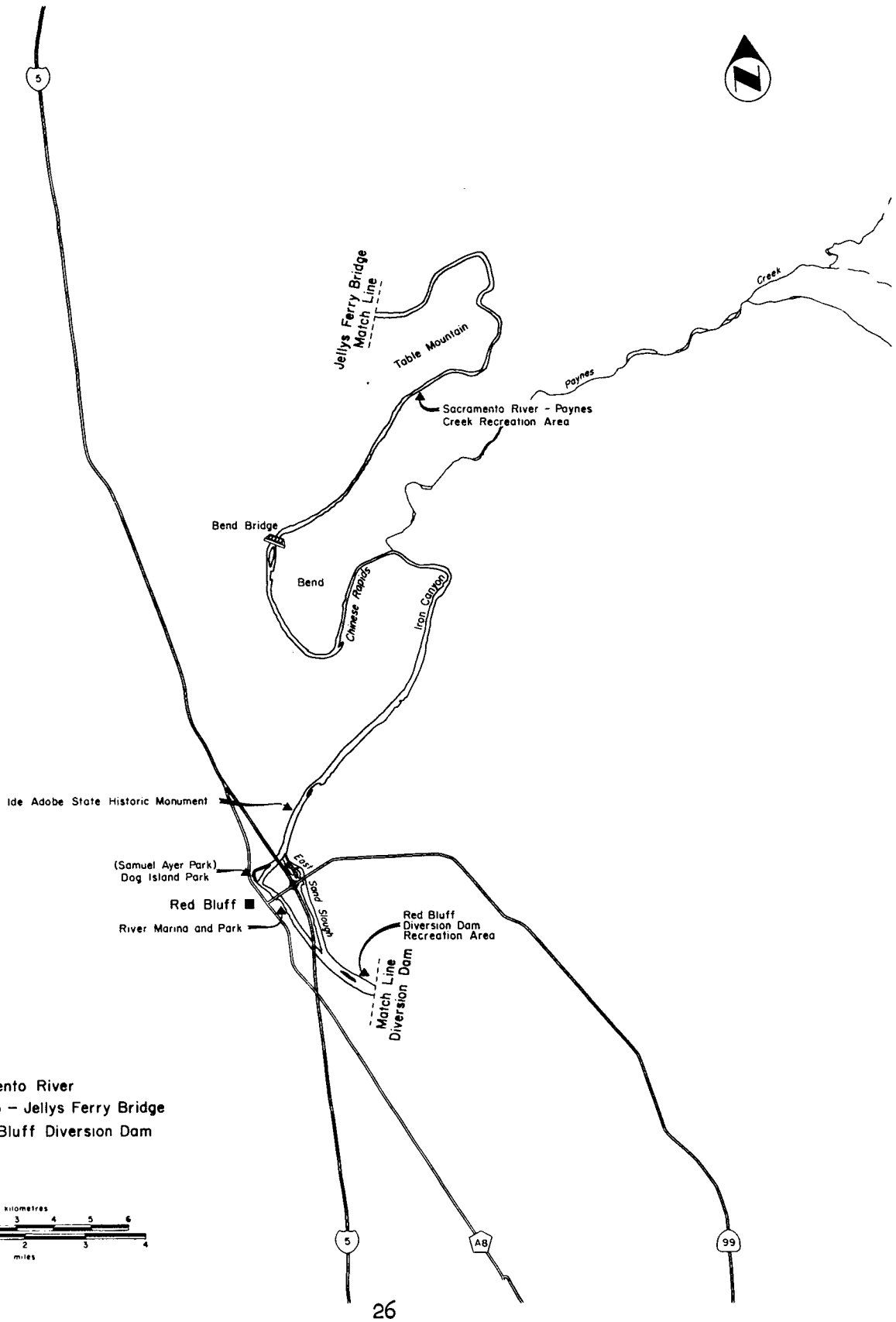
Relaxing (65 percent), fishing (41 percent), picnicking (28 percent), camping (17 percent), swimming/beach use (25 percent), and boating (13 percent) were the most frequently mentioned activities. Rafting/tubing (63 percent of boaters) was the most frequent type of boating in Reach 2, followed by canoeing (24 percent), and power boating (13 percent).

Creel Census Data

Shore anglers near Anderson mostly fished for anything they could catch (51 percent), trout (29 percent), steelhead (15 percent), or salmon (10 percent). They spent 49,000 hours catching 2,900 rainbow trout/steelhead, 7,500 sunfish, 500 nongame fishes, 300 largemouth/smallmouth bass, 100 chinook salmon, and 100 catfish.

Boat anglers fished for salmon (59 percent), trout (33 percent), steelhead (26 percent), or anything (23 percent). They fished 62,000 hours and caught 2,400 rainbow trout/steelhead, 1,500 chinook salmon, and 1,100 largemouth/smallmouth bass.

Figure 6



Sacramento River
Reach 3 – Jellys Ferry Bridge
to Red Bluff Diversion Dam

C—069314

C-069314

RIVER REACH 3 - JELLYS FERRY BRIDGE TO RED BLUFF DIVERSION DAM

Estimated Recreation Use

Recreation use in this reach totaled 348,000 hours (200,000 recreation days) in 1980. Relaxing (27 percent) was the most important activity, followed by fishing (17 percent), pleasure boating/water skiing (11 percent), excursions/special events (11 percent), picnicking (9 percent), camping (6 percent), swimming/beach use (6 percent). Rafting/tubing (5 percent) and canoeing (4 percent) were also important activities in this reach which includes scenic Iron Canyon and Chinese Rapids, perhaps the most beautiful and unspoiled reach of the entire river.

Important recreation sites included the Sacramento River-Paynes Creek Recreation Area operated by the Bureau of Land Management, Ide Adobe State Historic Monument, Dog Island Park, Red Bluff River Park and Marina, and the Red Bluff Diversion Dam Recreation Area.

Interview Data and Visitor Characteristics

A total of 359 interviews were collected near Red Bluff reflecting 882 people using the river. Eighty-two percent of these visitors said the river was the trip destination, 15 percent stopped while enroute elsewhere, and 3 percent were staying in the area. About 62 percent lived in Tehama or Shasta Counties, with 7 percent out-of-state. Day users totaled 73 percent, and overnight users 27 percent of the people interviewed.

The average length of stay for people staying overnight at the river was 4.0 days, and 7.4 days for people staying in the area. Day users averaged 2.8 hours at the river, with a harmonic mean of 1.7 hours.

Relaxing (57 percent), fishing (29 percent), sightseeing (26 percent), camping (25 percent), picnicking (21 percent), and pleasure boating/water skiing (20 percent) were the activities most frequently mentioned in this reach.

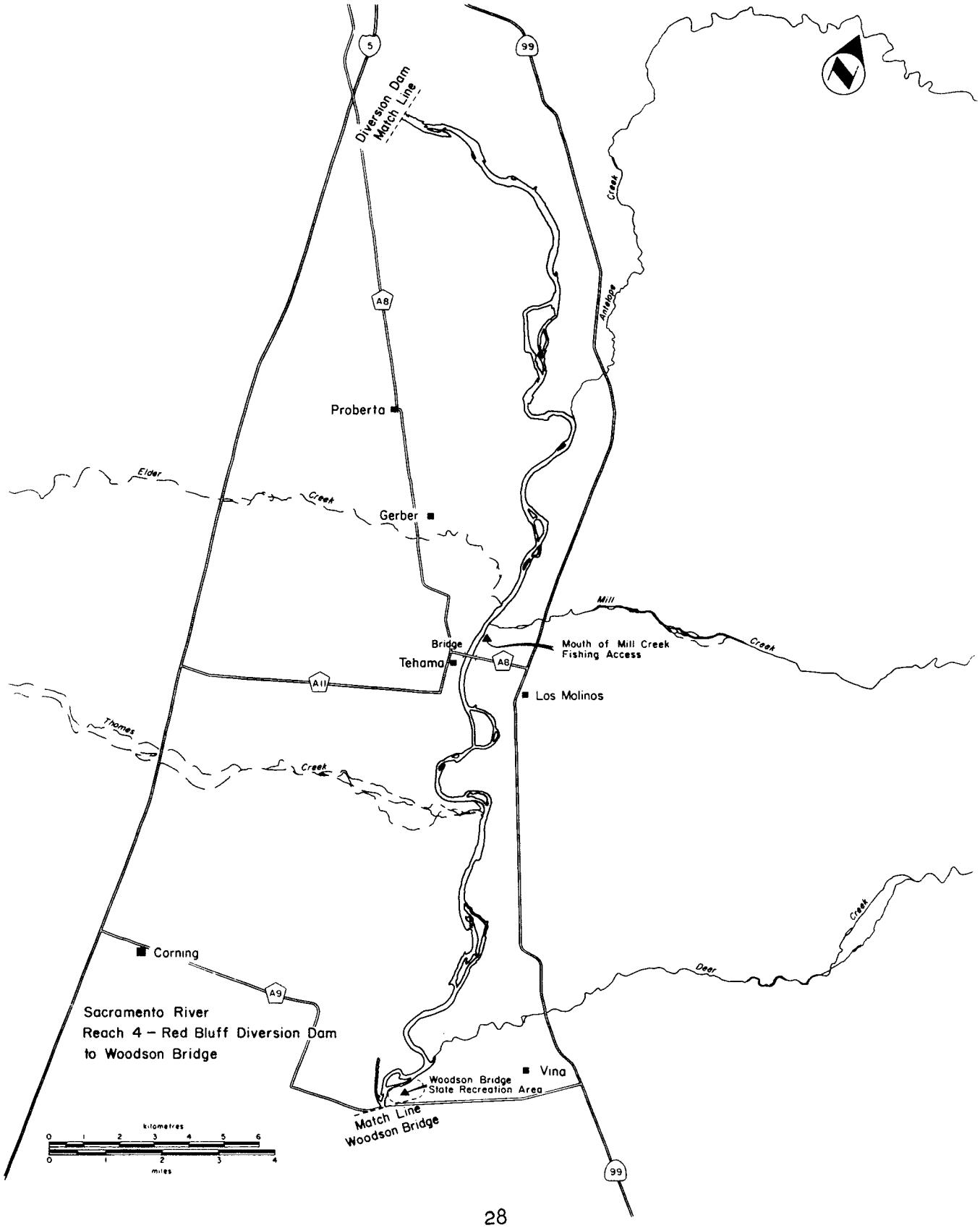
Rafting/tubing (38 percent of boaters), power boating (including water skiing) (37 percent), and canoeing (23 percent) were the major types of boating in this reach. We interviewed an occasional paddle boater or windsurfer at Lake Red Bluff (2 percent).

Creel Census Data

Shore anglers near Red Bluff usually fished for anything they could catch (58 percent), steelhead (23 percent), salmon (20 percent), or trout (17 percent). They fished 25,000 hours with an estimated catch of 3,000 rainbow trout/steelhead and 600 nongame fish.

Boat anglers in Reach 3 sought salmon (63 percent), trout (19 percent), or steelhead (17 percent). They spent 34,000 hours and caught 1,700 rainbow trout/steelhead, 300 chinook salmon, and 100 largemouth/smallmouth bass.

Figure 7



RIVER REACH 4 - RED BLUFF DIVERSION DAM TO WOODSON BRIDGE AND RIVER REACH 5 - WOODSON BRIDGE TO HAMILTON CITY BRIDGE

Estimated Recreation Use

Recreation use between Red Bluff and Woodson Bridge totaled 347,000 hours (137,000 recreation days) with fishing (38 percent) the major activity. Relaxing (17 percent), camping (13 percent), picnicking (12 percent), and swimming/beach use (8 percent) were other important activities. Much of this use occurred at Woodson Bridge State Recreation Area and adjacent Tehama County River Park. Canoeing (3 percent) was important in this reach and rangers at Woodson Bridge State Recreation Area offered guided trips from Tehama Bridge to Woodson Bridge each weekend during the summer.

Major access sites in Reach 4 included Mouth of Mill Creek Fishing Access, several private resorts at Tehama Bridge, Woodson Bridge State Recreation Area, and Tehama County River Park.

The river between Woodson Bridge and Hamilton City Bridge (Reach 5) had the lowest use of any reach surveyed in 1980, only 23,000 hours (9,000 recreation days). There is little river access in this reach except at the two highway bridges, so use in this reach was primarily boat fishing (65 percent). The only other significant activities were canoeing (11 percent), shore fishing (9 percent), and swimming/beach use (5 percent). There were no major access sites in this reach.

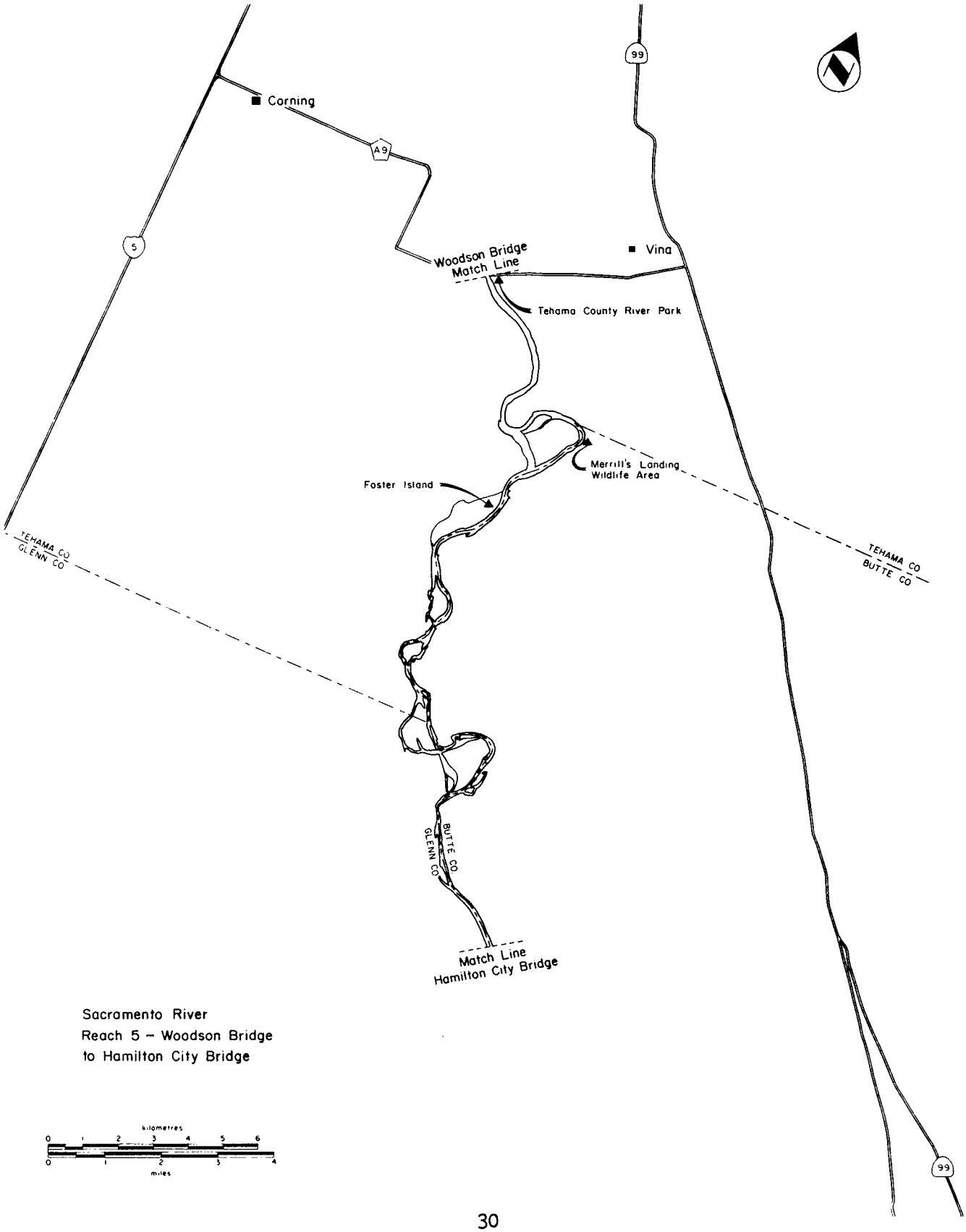
Interview Data and Visitor Characteristics

Only a few interviews were collected in Reach 5 because of the limited access and use. These were combined with interviews from Reach 4 since many of the recreationists observed in Reach 5 actually entered the river upstream at Woodson Bridge, where many interviews were collected.

We interviewed 427 recreationists representing 1,094 people using Reaches 4 and 5. Seventy-seven percent said the Sacramento River was the destination of their trip, 13 percent were enroute elsewhere, and 10 percent were staying in the area. Fifty-five percent lived in Tehama, Butte, or Shasta Counties, and about 5 percent were from out of state. About 52 percent of the people interviewed were day users, and 48 percent overnight visitors.

The average stay for people camping overnight at the river was 3.0 days and 6.1 days for those staying in the area. Day-use visitors spent 3.9 hours at the river with a harmonic mean of 2.6 hours.

Figure 8



Sacramento River
Reach 5 – Woodson Bridge
to Hamilton City Bridge

Relaxing (53 percent), fishing (46 percent), camping (42 percent), swimming/beach use (38 percent), picnicking (14 percent), and excursions/special events (13 percent) were the activities most frequently cited by recreationists in these reaches.

Canoeing was the most common type of boating (54 percent) among the people interviewed in these reaches, followed by rafting/tubing (27 percent) and power boating (19 percent).

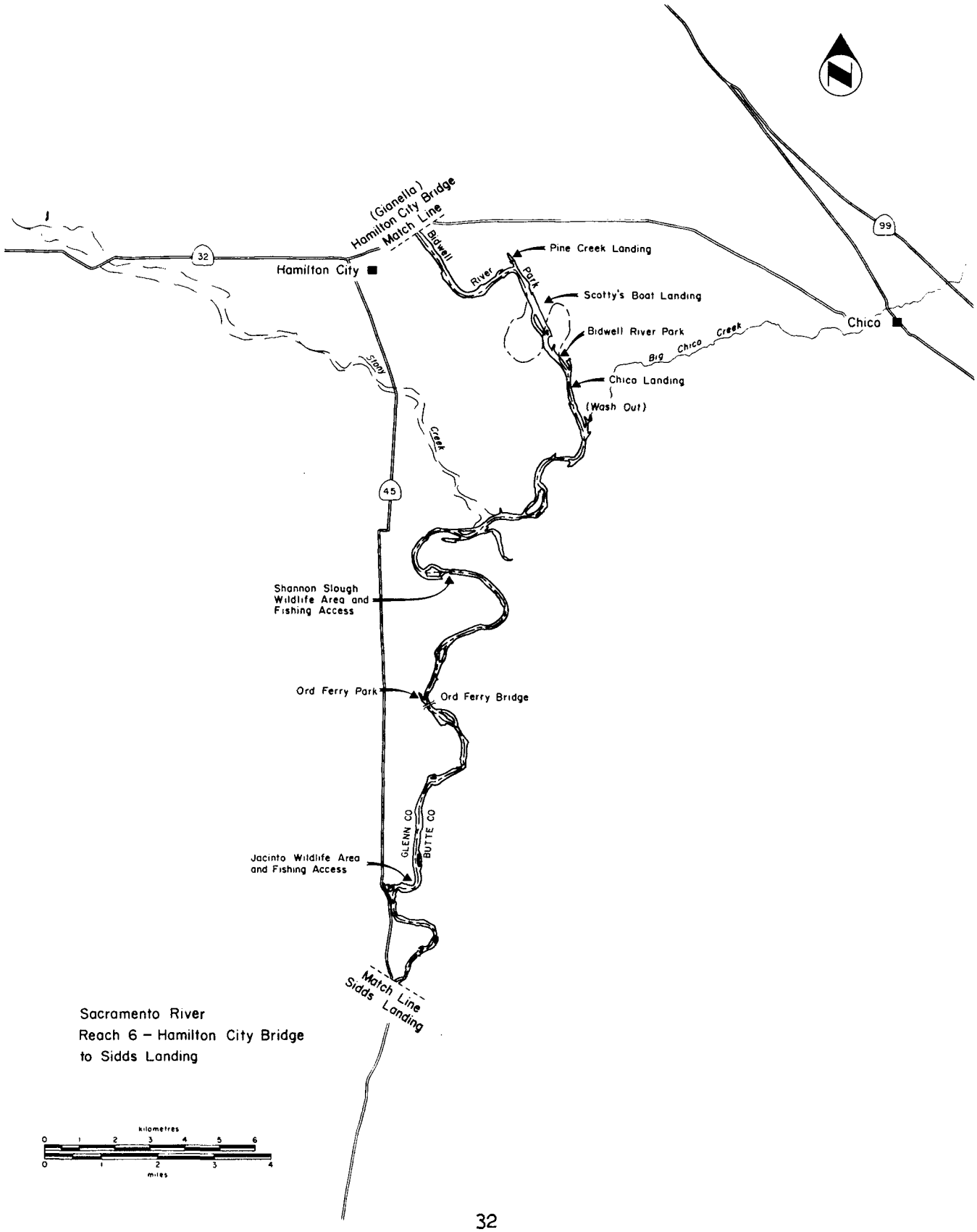
Creel Census Data

Creel census data for Reach 5 were combined with those from Reach 4 for the same reasons cited for the interview data.

Shore anglers most commonly fished for anything they could catch (46 percent). Steelhead (20 percent), American shad (18 percent), and salmon (11 percent) were also frequently sought. They fished 100,000 hours, catching 10,100 American shad, and 2,100 chinook salmon.

Boat anglers usually fished for salmon (46 percent), American shad (21 percent), or steelhead (13 percent). Shore anglers fished about 49,000 hours in these reaches and caught 1,250 largemouth/smallmouth bass, 1,100 rainbow trout/steelhead, 900 American shad, 400 striped bass, 300 non-game fish, 250 catfish, and 100 sunfish.

Figure 9



RIVER REACH 6 - HAMILTON CITY BRIDGE TO SIDDS LANDING

Estimated Recreation Use

Total recreation use in this reach was 223,000 hours (94,000 recreation days) in 1980, with the major activity rafting/tubing (42 percent) between Hamilton City Bridge and Chico Landing. Other important activities included fishing (29 percent), relaxing (12 percent), swimming/beach use (5 percent), and picnicking (4 percent). This is by far the most important tubing area on the river.

Major access sites included Hamilton City Bridge (Gianella Bridge River Access) for tubing and rafting, Pine Creek Landing and Scotty's Boat Landing (both private fishing resorts), Bidwell River Park and Big Chico Creek Area (plus the intermediate area known locally as "The Washout"), and Ord Bend Park.

Interview Data and Visitor Characteristics

We interviewed 382 people in Reach 6, who represented 905 recreationists. Ninety percent said the Sacramento River was the destination for their trip, 4 percent were enroute elsewhere, and 6 percent were staying nearby. About 85 percent of the people we interviewed lived in Butte or Glenn Counties. Ninety-one percent were day use visitors and 9 percent overnight visitors.

The average length of stay for overnighters was 4.0 days, and 4.9 days for people staying in the area. Day users averaged 3.4 hours at the river with a harmonic mean of 2.4 hours.

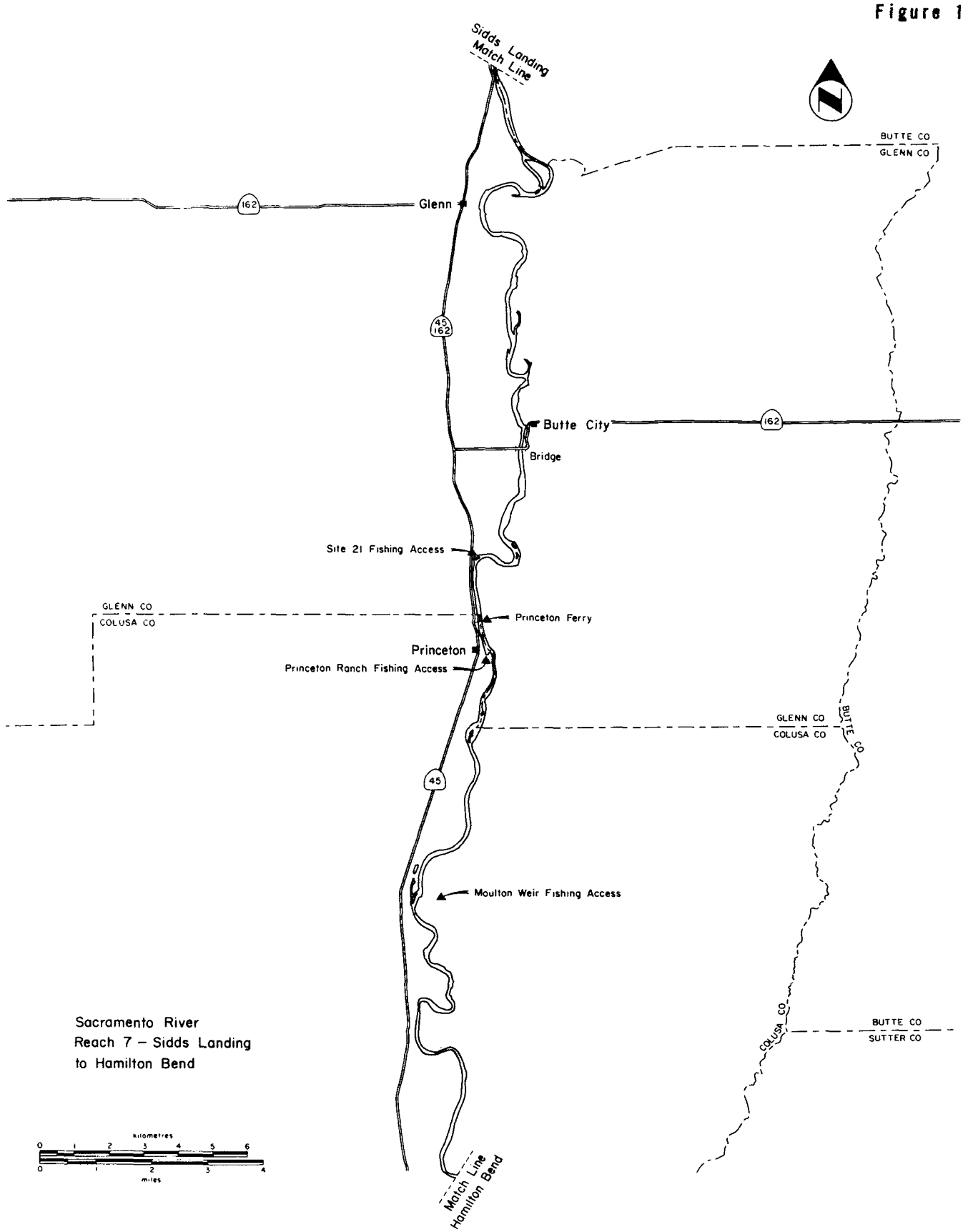
Fishing (45 percent), relaxing (42 percent), rafting/tubing (15 percent), picnicking (13 percent), and excursions/special events (11 percent) were the activities in which most recreationists participated. Rafting/tubing (78 percent of boaters), power boating (19 percent), and canoeing (3 percent) were the most frequent types of boating.

Creel Census Data

One-third of the shore anglers in Reach 6 said they were fishing for anything they could catch. Twenty-four percent were fishing for American shad, 21 percent for salmon, 12 percent for steelhead, 7 percent for catfish, 6 percent for largemouth/smallmouth bass, 4 percent for striped bass, 4 percent for sunfish, and 3 percent for trout. Shore anglers spent 42,000 hours fishing in Reach 6 and caught an estimated 3,400 catfish, 3,000 sunfish, 1,500 American shad, 700 largemouth/smallmouth bass, 300 nongame species, 200 chinook salmon, and 100 rainbow trout/steelhead.

Boat anglers also fished for many different species. About one-third sought salmon, 20 percent American shad, 18 percent striped bass, 14 percent largemouth/smallmouth bass, 10 percent anything, 8 percent steelhead, 8 percent catfish, and 4 percent trout. Boat anglers fished 22,000 hours and caught 500 largemouth/smallmouth bass, 300 catfish, 300 sunfish, and 300 American shad.

Figure 10



Sacramento River
Reach 7 – Sidds Landing
to Hamilton Bend

RIVER REACH 7 - SIDDS LANDING TO HAMILTON BEND, RIVER REACH 8 - HAMILTON BEND TO MERIDIAN BRIDGE AND RIVER REACH 9 - MERIDIAN BRIDGE TO ELDORADO BEND

Estimated Recreation Use

Like Reach 5, River Reach 7 had relatively low use due to limited public access. Estimated 1980 use totaled 81,000 hours (28,000 recreation days) with 72 percent fishing. Other activities included canoeing (11 percent), swimming/beach use (7 percent), and rafting/tubing (4 percent).

There were several minor access sites in this reach but no major ones. Most of the boat fishermen launched downstream near Colusa or at Princeton Ranch Fishing Access.

Reach 8 was a major fishing area with angling 53 percent of the estimated 335,000 recreation hours (115,000 recreation days) in 1980. Other important activities included camping (16 percent), swimming/beach use (9 percent), relaxing (9 percent), pleasure boating/water skiing (4 percent), and picnicking (3 percent).

Important access sites include Colusa Weir River Access, Cruise 'N Tarry Marina, Colusa-Sacramento River State Recreation Area, Ward's Boat Landing, and Bob and Pat's Landing.

Boating also played an important role in the recreation use of relatively inaccessible Reach 9. Total use was 205,000 hours (68,000 recreation days), with fishing (61 percent), swimming/beach use (15 percent), and pleasure boating/water skiing (13 percent) the major activities. Other pursuits included camping (4 percent), and relaxing (3 percent).

Access sites were few in this reach, primarily Grimes Boat Landing, Tisdale Weir Fishing Access, and several minor sites.

Interview Data and Visitor Characteristics

A total of 478 people were interviewed in River Reaches 7, 8, and 9, representing 1,258 recreationists. Only a few interviews were obtained in Reach 7 due to limited access and the predominance of boat fishermen, many of whom launched downstream at sites near Colusa (Reach 8). Only a few interviews were made in Reach 9 for similar reasons. Much of the use in this reach was by boat anglers who launched upstream near Colusa, or downstream at Knights Landing (Reach 10). Summertime boaters and water skiers also launched mostly at Knights Landing. Consequently, we felt many of the people using Reaches 7 and 9 were included in the interviews obtained in Reaches 8 and 10.

The Sacramento River was the trip destination for 81 percent of the people interviewed, while 15 percent stopped enroute elsewhere, and 4 percent were staying overnight in the area. Forty-three percent of these river visitors lived in Colusa, Butte, or Sutter Counties, and 6 percent came from out of state. Visitors to this reach came from more diverse locations than any other river reach. About 52 percent were day users and 48 percent overnighters.

Figure 11

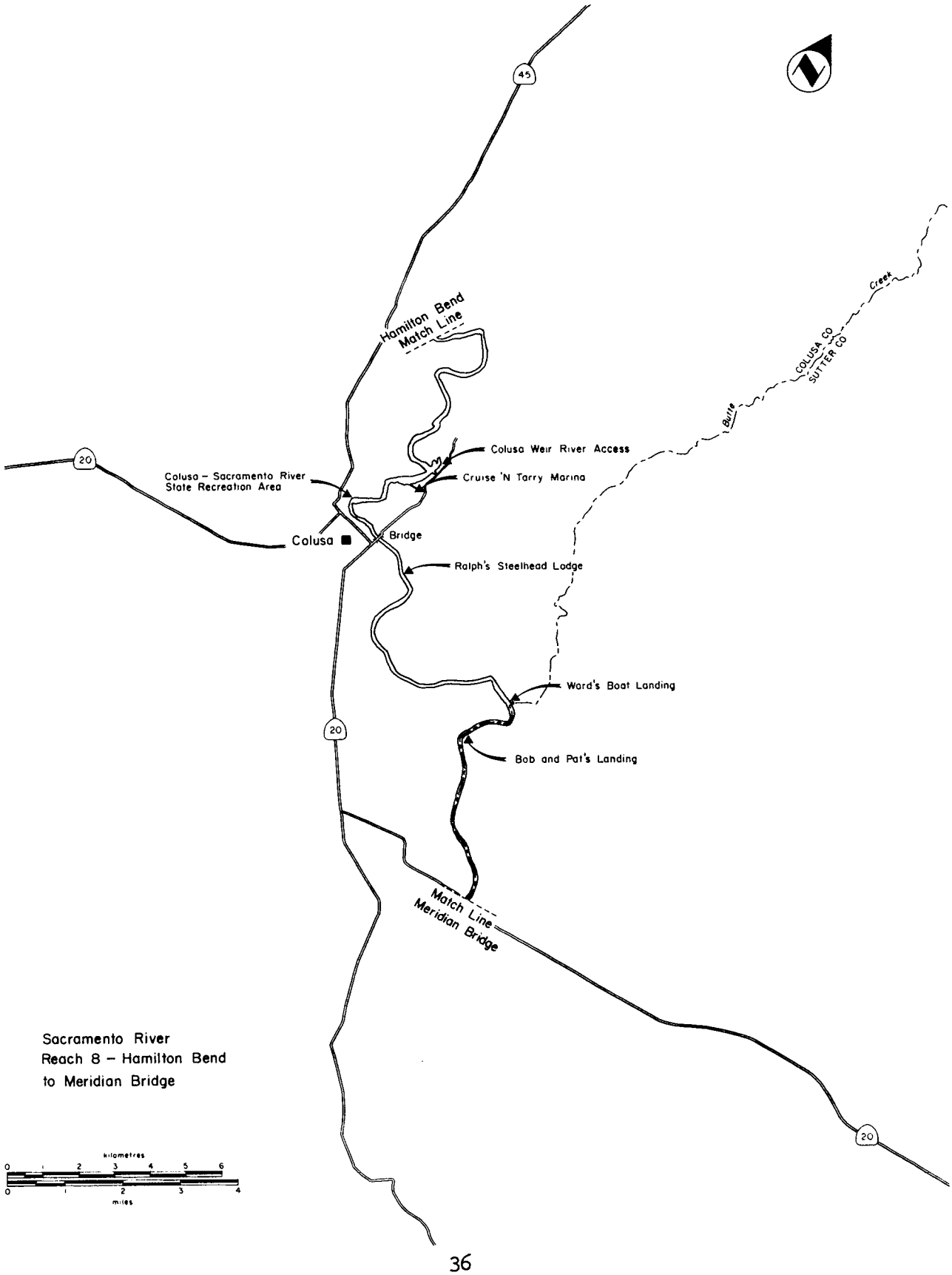
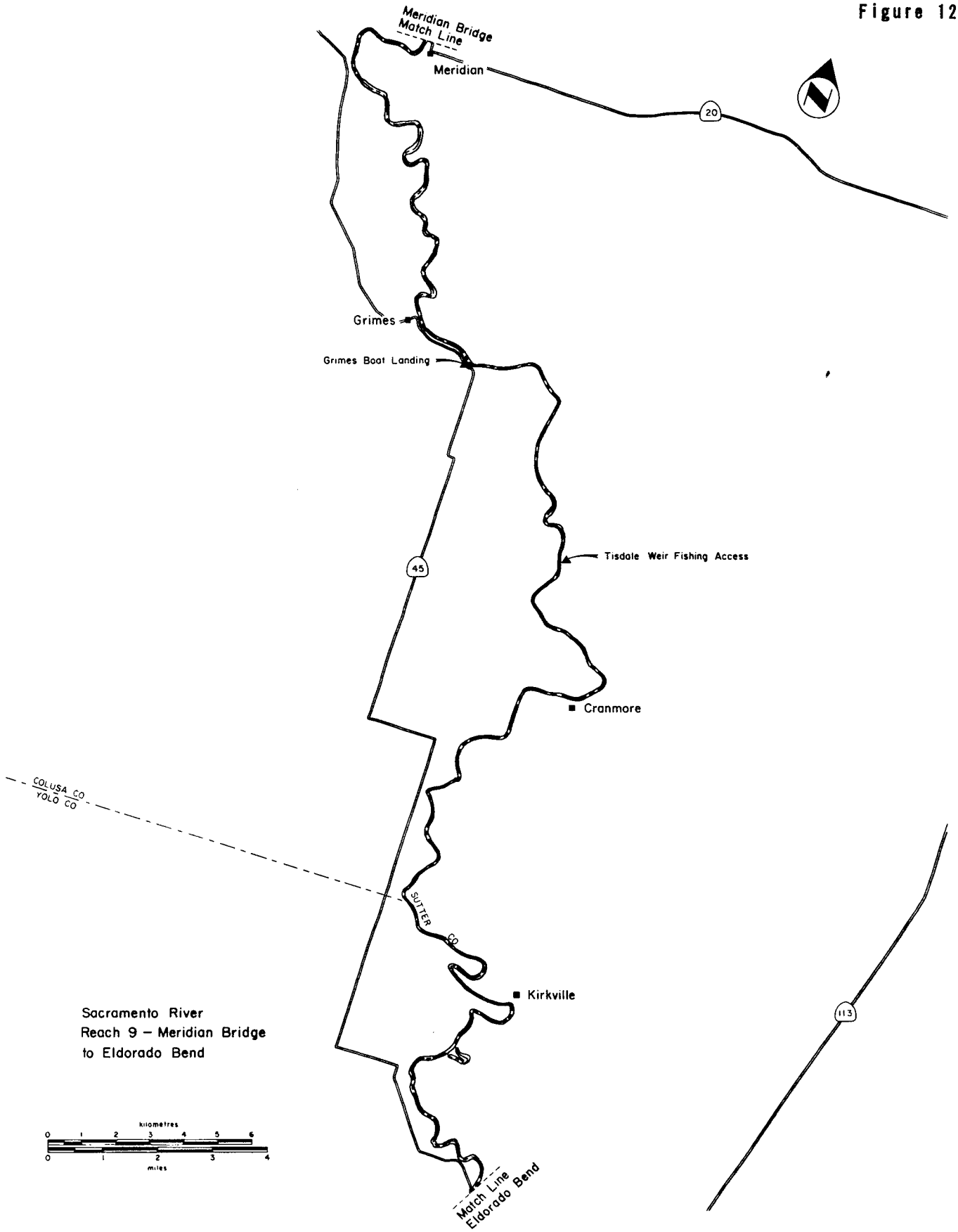


Figure 12



The average length of stay for people staying overnight at the river was 3.7 days, and 3.1 days for people staying in the area. Day users averaged 4.2 hours at the river, with a harmonic mean of 2.9 hours.

Fishing (50 percent), camping (48 percent), relaxing (52 percent), swimming/beach use (29 percent), picnicking (18 percent), and sightseeing (12 percent) were the activities most frequently mentioned by recreationists in Reaches 7, 8, and 9.

Power boating (63 percent of boaters), rafting/tubing (24 percent), and canoeing (13 percent) were the most common types of boating.

Creel Census Data

Creel census data for Reaches 7, 8, and 9 were combined for the same reasons cited for the interviews.

Shore anglers fished for anything they could catch (38 percent), striped bass (32 percent), catfish (17 percent), salmon (13 percent), largemouth/smallmouth bass (7 percent), and sturgeon (7 percent). Shore anglers fished 95,000 hours in Reaches 7, 8, and 9. They caught 8,850 catfish, 2,400 striped bass, 1,850 largemouth/smallmouth bass, 1,700 sunfish, 500 chinook salmon, and 300 sturgeon.

Boat anglers fished for striped bass (61 percent), salmon (25 percent), sturgeon (19 percent), anything (18 percent), and catfish (17 percent).

They fished 268,000 hours in these reaches and caught more fish than from any other area. The catch included 30,200 striped bass, 9,200 catfish, 3,900 chinook salmon, 1,000 sturgeon, and 600 sunfish.

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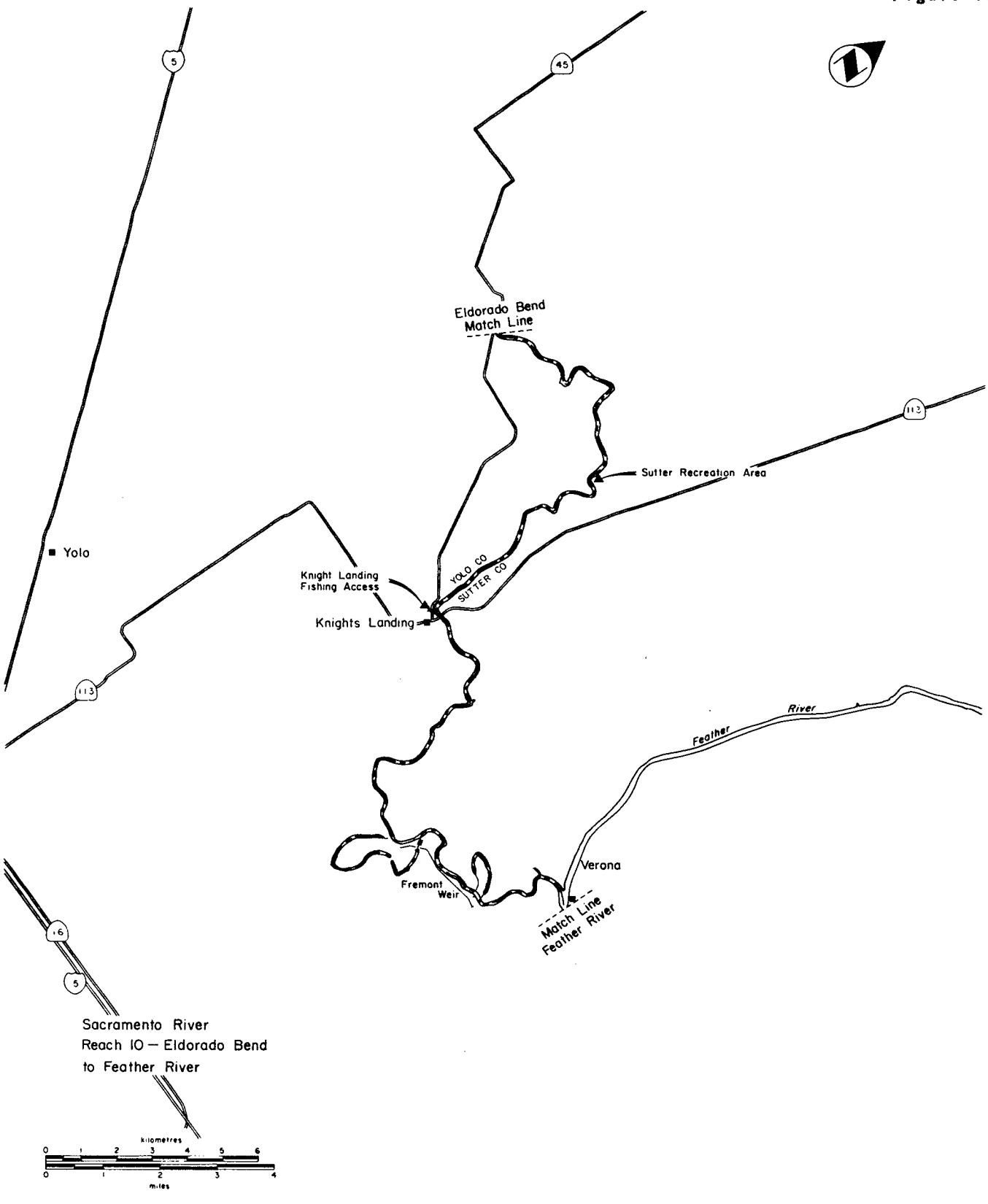
Figure 13



RIVER REACH 10 - ELDORADO BEND TO MOUTH OF FEATHER RIVER

Estimated Recreation Use

This reach near Knights Landing is well known for striped bass, catfish, and sturgeon fishing. Recreation use totaled 430,000 hours (134,000 recreation days) in 1980, with fishing (44 percent) the major activity. This was the second most important shore fishing area on the river. Other major activities included swimming/beach use (17 percent), often associated with water skiing, pleasure boating/water skiing (17 percent), camping (9 percent), and relaxing (7 percent).

There were about 15 access sites along this reach, with Knights Landing Fishing Access and several sites at Fremont Weir the most heavily used during the spring and several sites above Knights Landing the most heavily used during the summer.

Interview Data and Visitor Characteristics

We made 320 interviews near Knights Landing, which represented 983 recreationists. Nearly all (99 percent) said the river was their trip destination, and 1 percent were enroute elsewhere. About 79 percent of the people interviewed lived in Yolo or Sacramento Counties. Day use visitors totaled 61 percent and overnight visitors 39 percent.

People staying overnight at the river averaged 4.4 days, and those few staying in the area averaged 10.5 days. Day use visitors averaged 3.8 hours, with a harmonic mean of 2.6 hours.

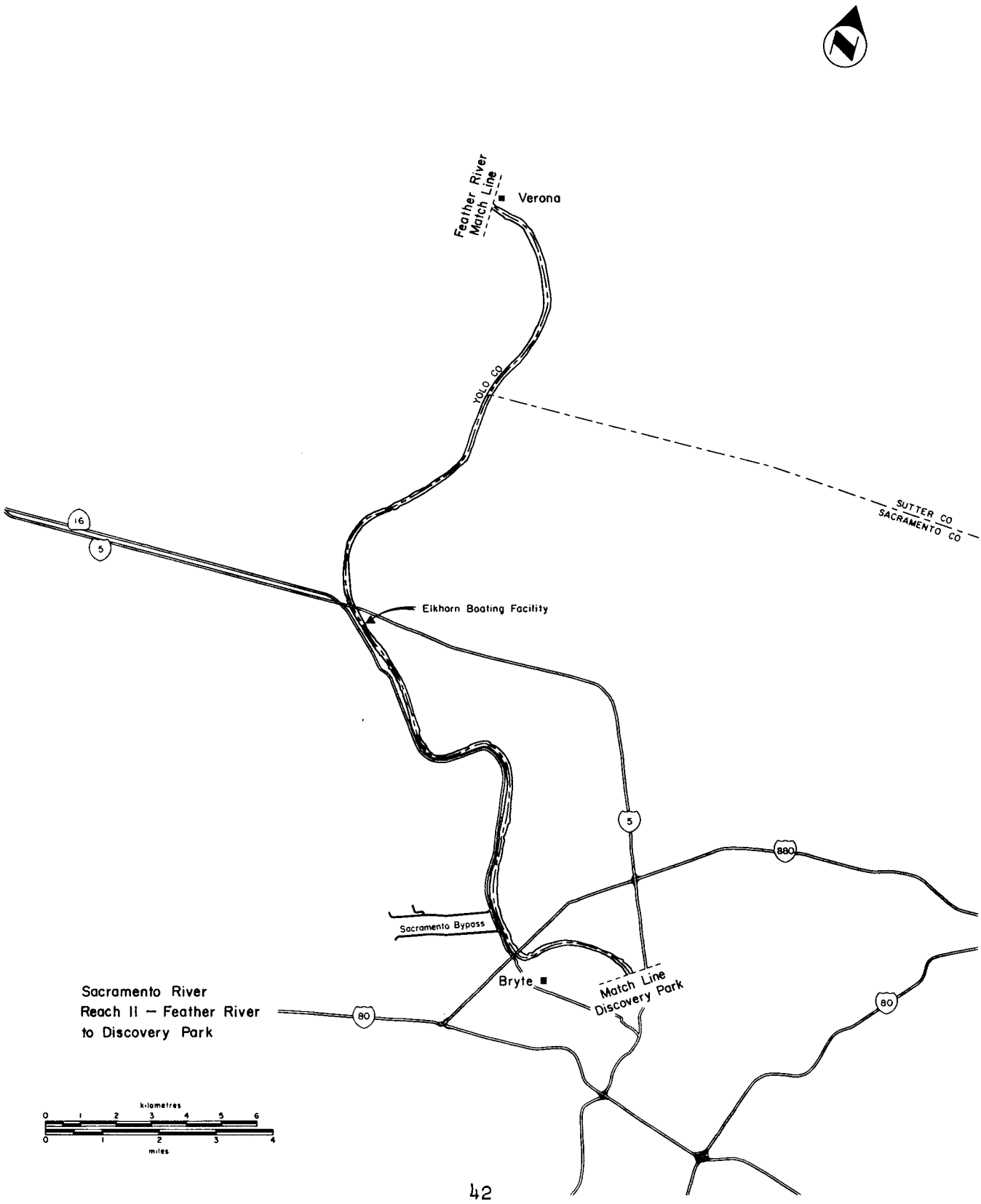
Relaxing (68 percent), beach use (58 percent), swimming/wading (49 percent), picnicking (45 percent), fishing (45 percent), pleasure boating (40 percent), camping (39 percent), and water skiing (36 percent) were the the most frequently cited activities. As these data suggest, this reach is a major recreation area for people from the metropolitan Sacramento area with boating and water skiing in the summer months and fishing in the spring months the primary activities. Power boating was the only type mentioned by the boaters interviewed. About 10 percent of these were houseboating.

Creel Census Data

Shore anglers near Knights Landing most frequently fished for catfish (44 percent), striped bass (37 percent), sturgeon (30 percent), or anything they could catch (21 percent). A few sought steelhead (8 percent) or salmon (4 percent). Shore anglers fished 130,000 hours in Reach 10, and caught 14,200 catfish, 1,000 striped bass, 800 sunfish, 300 sturgeon, 100 largemouth/smallmouth bass, and 100 rainbow trout/steelhead.

Boat anglers fished for anything (53 percent), striped bass (47 percent), catfish (23 percent), salmon (17 percent), and steelhead (6 percent). They fished about 60,000 hours and caught 1,800 striped bass and 600 catfish.

Figure 14



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RIVER REACH 11 - FEATHER RIVER TO DISCOVERY PARK

Estimated Recreation Use

This reach includes the river from the mouth of the Feather River downstream to Sacramento. Recreation use totaled 400,000 hours (128,000 recreation days) in 1980. Major activities included fishing (45 percent), pleasure boating/water skiing (28 percent), swimming/beach use (11 percent), relaxing (8 percent), picnicking (3 percent), and camping (3 percent).

Access was provided by eight private marinas, the Elkhorn Boating Facility (county), and the Sacramento Bypass Fishing Access. People also fished along county roads on both sides of the river.

Interview Data and Visitor Characteristics

We collected 246 interviews representing 784 recreationists in Reach 11. The Sacramento River was the intended destination for 97 percent of these people, while 2 percent were enroute elsewhere, and 1 percent were staying in the area. About 83 percent lived in Sacramento or Yolo Counties. Eighty-seven percent were day users and 13 percent overnighters.

The average length of stay for people camping at the river was 4.7 days and 3.0 days for people staying in the area. Day use visitors spent 4.8 hours with a harmonic mean of 3.1 hours.

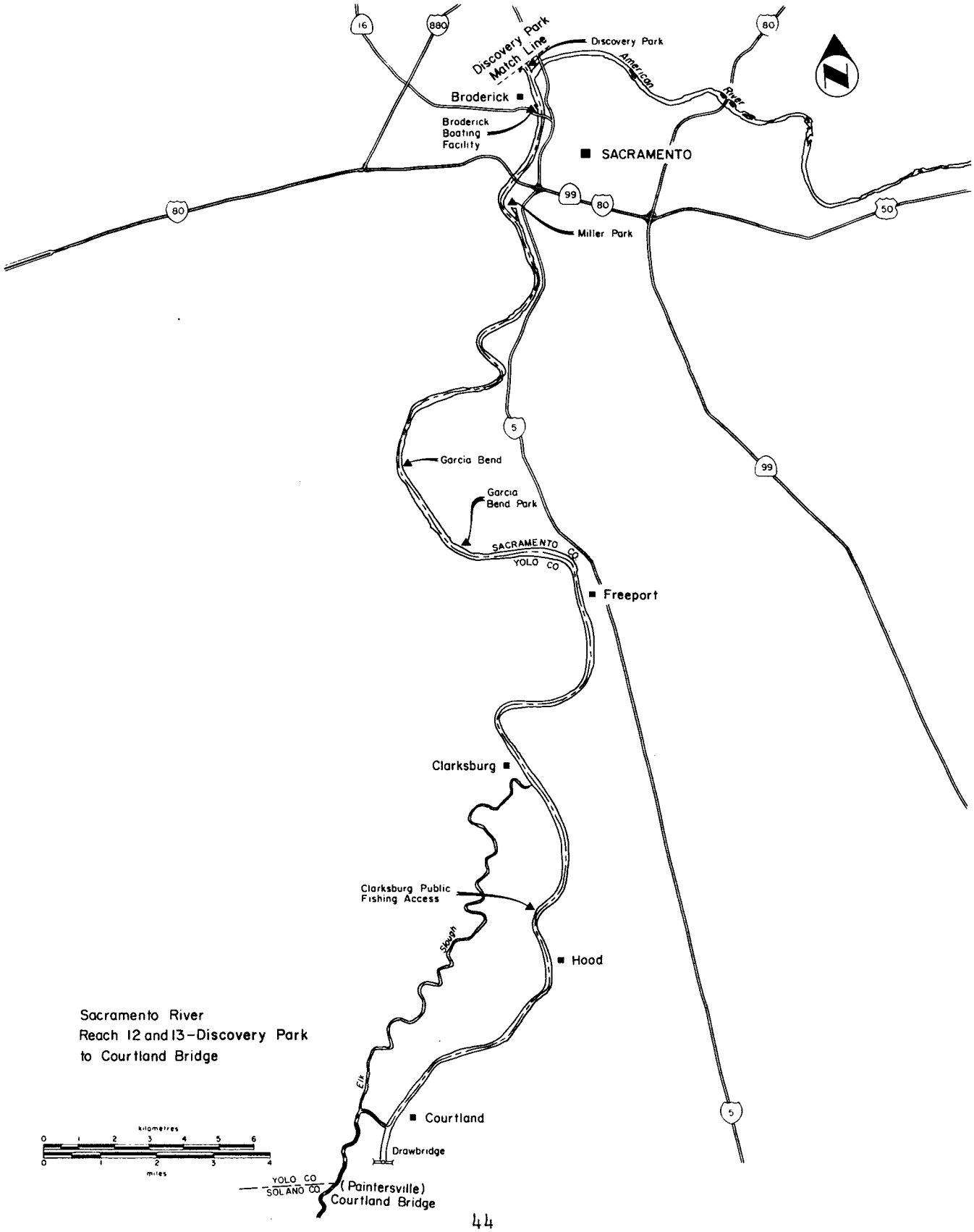
Fishing (41 percent), pleasure boating (29 percent), swimming/beach use (27 percent), water skiing (27 percent), picnicking (24 percent), and relaxing (22 percent) were the most frequently mentioned activities. All the boaters interviewed said they were power boating or jet skiing.

Creel Census Data

Shore anglers in Reach 11 fished mostly for anything (45 percent), striped bass (31 percent), catfish (19 percent), salmon (9 percent), sturgeon (8 percent), rainbow trout/steelhead (7 percent), and American shad (4 percent). Shore anglers fished 45,000 hours and caught 3,100 American shad, 300 striped bass, 300 nongame fish, 100 catfish, 100 chinook salmon, and 100 rainbow trout/steelhead.

Boat anglers sought striped bass (44 percent), anything (29 percent), salmon (28 percent), rainbow trout/steelhead (13 percent), catfish (12 percent), American shad (7 percent), and sturgeon (6 percent). They spent 135,000 hours fishing in Reach 11 and caught 5,900 catfish, 2,200 striped bass, 1,900 rainbow trout/steelhead, 1,300 American shad, 900 largemouth/smallmouth bass, 200 chinook salmon, and 200 sturgeon.

Figure 15



RIVER REACH 12 - DISCOVERY PARK TO MILLER PARK

Estimated Recreation Use

This reach includes the river in downtown Sacramento and had the highest use for several activities of any river reach. Recreation was primarily concentrated in county and city parks and two private boat landings. Recreation use totaled 940,000 hours (427,000 recreation days) in 1980. Major activities included relaxing (30 percent), fishing (24 percent), pleasure boating/water skiing (13 percent), swimming/beach use (12 percent), picnicking (11 percent), and outdoor games/sports (4 percent).

Discovery Park was by far the major access site in this reach and provided access to both the Sacramento and lower American Rivers. The Broderick Boating Facility (Yolo County) and Miller Park were also important use areas.

Interview Data and Visitor Characteristics

We interviewed 452 people representing 1,157 recreationists in downtown Sacramento. The river was the destination for 94 percent of these people, 4 percent were enroute elsewhere, and 2 percent were staying in the area. About 86 percent lived in Sacramento or Yolo Counties and 3 percent were from out of state. Day use visitors were 96 percent of the total and overnight visitors 4 percent.

The average length of stay for people staying overnight at the river was 3.0 days. People staying in the area averaged 4.7 days. Day users stayed at the river 3.4 hours, with a harmonic mean of 2.2 hours.

Fishing (42 percent), pleasure boating (23 percent), picnicking (21 percent), relaxing (17 percent), water skiing (13 percent), and swimming/beach use (18 percent) were the activities people most frequently mentioned. Nearly all of the boaters we interviewed were power boating or jet skiing (97 percent), but a few people were sail boating (3 percent).

Creel Census Data

Shore anglers in downtown Sacramento fished for anything they could catch (49 percent), striped bass (35 percent), catfish (13 percent), salmon (9 percent), nongame fish (6 percent), and rainbow trout/steelhead (5 percent). They fished 105,000 hours and caught an estimated 3,300 striped bass, 700 largemouth/smallmouth bass, 700 nongame fish, 500 catfish, 100 rainbow trout/steelhead, and 100 sunfish.

Boat anglers sought salmon (38 percent), striped bass (34 percent), anything (27 percent), rainbow trout/steelhead (11 percent), and catfish (7 percent). Some of the boat anglers we interviewed may have actually fished the lower American River. Boat anglers fished 122,000 hours and caught 5,200 catfish, 1,200 chinook salmon, 500 striped bass, and 400 rainbow trout/steelhead.

RIVER REACH 13 - MILLER PARK TO PAINTERSVILLE BRIDGE

Estimated Recreation Use

This reach, lying just downstream from metropolitan Sacramento, had the second highest recreation use, and by far the most fishing of any reach surveyed. It was also the most important reach for boating and water skiing. Total recreation was 740,000 hours (258,000 recreation days) with fishing 66 percent of the total. Other major activities were pleasure boating/water skiing (20 percent), swimming/beach use (5 percent), and relaxing (4 percent).

Major access sites included several private marinas, Garcia Bend County Park, and Clarksburg Fishing Access. Many boats traveled downstream from Discovery Park, Broderick Boating Facility, and Miller Park to use this area.

Interview Data and Visitor Characteristics

We interviewed 266 people in Reach 13, who represented 674 recreationists. Ninety-seven percent said the river was their destination, while 2 percent were enroute, and 1 percent stayed overnight in the area. About 86 percent lived in Sacramento and Yolo Counties. Day users comprised 74 percent and overnighters 26 percent of the people we interviewed.

Average length of stay for people staying overnight at the river was 3.3 days and 8.3 days for people staying in the area. Day users spent 4.0 hours at the river, with a harmonic mean of 2.8 hours.

Fishing (76 percent), relaxing (34 percent), swimming/beach use (31 percent), camping (25 percent), pleasure boating (23 percent), and water skiing (13 percent) were the activities most people said they were going to do in Reach 13. All of the boaters interviewed said they were power boating or jet skiing.

Creel Census Data

Shore fishermen mostly fished for anything they could catch (59 percent). They also sought striped bass (36 percent), sturgeon (11 percent), catfish (10 percent), and American shad (7 percent). Shore anglers fished 199,000 hours and caught more fish in Reach 13 than in any other section of the river. The catch included 29,000 catfish, 6,800 striped bass, 5,500 American shad, 1,200 largemouth/smallmouth bass, and 500 nongame fish.

Boat anglers fished for striped bass (59 percent), anything (47 percent), catfish (12 percent), largemouth/smallmouth bass (10 percent), and sturgeon (8 percent). They fished 289,000 hours and caught 17,200 striped bass, 900 chinook salmon, and 900 catfish.

DISCUSSION

This section evaluates the accuracy of the recreation use counts, interviews, and creel censuses conducted on the Sacramento River in 1980. It discusses several limitations of the survey and compares the 1980 survey results with those obtained in 1973.

The estimates of recreation hours presented in this report include only daytime activities associated with the river. The survey covered the primary fishing hours (generally the hours of daylight plus two). It is legal to fish the Sacramento River at night, although trout and salmon may not be taken at night north of Interstate 80.

Vehicle traffic counters at Anderson River Park, Red Bluff Diversion Dam, and Colusa-Sacramento River State Recreation Area indicated that in 1973 most recreation in these areas occurred during the hours represented by the use counts. However, some use also occurred at night and was not counted. For example, a better estimate of camping can be obtained by doubling the hours recorded in this survey. Also, we did not measure a considerable amount of fishing for catfish and sturgeon that occurred at night near Colusa, Knights Landing, and along the lower river.

Recreation at developed facilities which are nearby but largely unrelated to the river also was not counted. These include swimming pools at Redding and Red Bluff, a golf course at Anderson, the rodeo grounds and Civic Auditorium at Redding, and baseball diamonds at Redding and Los Molinos.

Several special events were not counted but are discussed separately: an organized raft race from Redding to Anderson River Park on July 20, boat drag races at Red Bluff on Memorial Day and Labor Day weekends, and the July 4th fireworks displays at Redding, Red Bluff, Woodson Bridge, and other locations along the lower river.

The third annual Sacramento River Raft Race sponsored by the Redding Jaycees attracted 637 official entries and several thousand spectators. Many other rafters and canoers joined the race in an "unofficial" status. The race started at the public boat ramp near the Posse Grounds in Redding and ended at the North Street Bridge in Anderson. Following the race a large picnic was held in Anderson River Park. Race entrants and spectators were excluded from the use count summaries on July 20, but a considerable amount of peripheral use was recorded.

The Northern California Drag Boat Championships were held at Sand Slough near Red Bluff Diversion Dam on Memorial Day and Labor Day weekends in 1980. More than 100 boats were entered in the May races with about 2,000 spectators on Saturday and over 3,000 on Sunday. The Labor Day races were an even bigger event, as an estimated 10,000 people watched boats and skiers on Saturday and Sunday. People at these events were not counted, although we did record some additional boating and park use in the Red Bluff area due to the many weekend visitors attracted by the races.

The July 4th fireworks displays at several locations along the river and related Independence Day activities attracted thousands of people to riverside parks. We did not estimate use at these events because, by chance, no surveys were scheduled for the July 4th weekend. However, many of these activities were not river-related uses.

Two 400-500 passenger riverboats cruise the lower Sacramento River and Delta between the Port of Sacramento and San Francisco on weekends during the summer and fall months. At least six of the cruise dates coincided with scheduled survey dates during 1980, but the passengers on these boats were not included in the use counts because we could not accurately count them.

Limitations of the Use Counts

Visibility of recreationists from an airplane (usually a Cessna 172) flying 150-180 m (500-600 ft) above terrain was generally good, but it was hard to make accurate counts in a few areas. For example, dense tree cover at Anderson River Park, Woodson Bridge, and Colusa-Sacramento State Recreation Areas often concealed large numbers of people. Counts by ground surveyors were more accurate in these areas and were used to correct the aerial counts when necessary. The ground level counts were also used to determine the pattern of use throughout the day and to expand the aerial counts. Despite the use of both aerial and ground counts, some recreationists may have been temporarily out of sight during use count periods, perhaps in travel trailers, restrooms, or other locations. However, the counts agreed closely and were generally quite accurate when visibility was good and when use was low.

Limitations of Interviews

We interviewed about 3 percent of the recreationists using the river on the survey days. By river reach, coverage ranged from 1 to 6 percent. Overall, we interviewed about 0.4 percent of the estimated total use for 1980, with coverage by reach ranging from 0.2 to 0.9 percent.

Although interviewers attempted to contact visitors randomly, several sources of bias were possible. Bias may have been introduced by conscious or unconscious selection of recreationists in some activities or possessing certain characteristics of age, race, or sex; for example, when attempting to select a "representative" sample. Bias may also have been introduced by failure to cover all access points, as with private homes and boat docks along the river. Rigorous sampling methods were not used to conduct the interviews; instead, we conducted a roving survey which tended to emphasize the more accessible and more heavily used areas.

Comparison of Use Counts and Interviews

Comparison of the use count and interview data indicates the degree each was representative of the actual recreation use. Except for Reaches 6, 12, and 13, the distribution of interviews among the survey reaches was similar to the distribution of use counted during the aerial and ground surveys (Table 10).

TABLE 10

COMPARISON OF RECREATION INTERVIEW DISTRIBUTION AND USE COUNTED ON SURVEY DAYS, BY SURVEY REACH

Survey Reach	1	2	3	4-5	6	7-8-9	10	11	12	13	Total
Percent of People Interviewed	11	9	9	11	10	13	10	8	12	7	100
Percent of Use Counted on Survey Days	8	9	7	8	6	14	9	8	17	14	100

Comparison of activities reported by recreationists we interviewed to activities actually observed during the use counts also showed reasonable similarity. Boat fishing probably was greatly under-represented in the interviews, while beach use, picnicking, and just relaxing were somewhat over-represented. It was easier to contact these relatively stationary recreationists than the more mobile and elusive boat anglers (Table 11).

TABLE 11

COMPARISON OF ACTIVITY COMPOSITION FROM INTERVIEWS AND FROM USE COUNTS

Activity	Shore Fish	Boat Fish	Boat/ Water Ski	Picnic	Swim/ Beach Use	Relax	Camp/ Misc.	Total
Percent from Interviews	13	6	16	11	14	25	15	100
Percent from Use Counts	16	23	17	6	9	17	12	100

Limitations of the Creel Census

About 7 percent of the estimated hours of shore fishing and 2 percent of the hours of boat fishing on the Sacramento River were censused on the survey days. By reach, coverage ranged from 3 to 9 percent for shore fishing and 1 to 8 percent for boat fishing. Overall, we censused about 0.8 percent of the estimated total hours of shore fishing and 0.2 percent of the total hours of boat fishing for the year. Coverage by reach ranged from 0.3 to 2.2 percent for shore fishing and 0.1 to 1.0 percent for boat fishing.

We did not census the considerable amount of night fishing for catfish, sturgeon, and shad that occurs along the lower river. This survey included only daytime recreation, generally from dawn to dark. Thus, a large part of the catch of catfish, sturgeon, and shad was not included in these data.

The distribution of angler hours censused was generally similar to the distribution of estimated angler hours on the survey days (Table 12).

TABLE 12

DISTRIBUTION OF ANGLER HOURS CENSUSED
COMPARED TO DISTRIBUTION OF ESTIMATED ANGLER HOURS

Survey Reach		1	2	3	4-5	6	7-8-9	10	11	12	13	Total
Percent of Angler Hours Censused	S - 4	7	2	8	14	19	19	5	12	10		100
	B - 1	11	13	3	3	14	3	20	19	13		100
Percent of Estimated Angler Hours	S - 4	6	3	6	6	15	17	5	12	26		100
	B - 2	5	4	9	2	28	6	12	9	23		100

S = Shore fishing
B = Boat fishing

We censused a relatively high percentage of shore anglers in Reach 6, and a very low percentage in Reach 13. The census of boat anglers was more variable. We censused a relatively high percentage in Reaches 2, 3, 11, and 12, and a low percentage in Reaches 4-5, 7-8-9, and 13.

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Comparison With Other Surveys

In 1973, the Department of Water Resources conducted a year-long survey of recreation on the river between Keswick Dam and Colusa. From June through August, the U. S. Corps of Engineers surveyed the river from Colusa to Sacramento (USCE, 1975). The Corps estimated use below Colusa for the entire year using information from both surveys.

Comparison of the 1973 data with the 1980 results suggests that recreation use on the river between Keswick Dam and Sacramento has increased about 24 percent (3.1 percent compounded annually). Unfortunately, because the Corps' survey was conducted only during the summer months and because of differences in activity interpretation, it was not possible to compare trends in specific activities for the entire river.

However, it was possible to compare activities in the reach from Keswick Dam to Colusa, which was included in both Department of Water Resources' surveys. Generally, recreation in this portion of the river increased about 15 percent from 1973 to 1980 (about 2.0 percent compounded annually). Boating increased considerably more, with rafting/tubing (+200 percent), canoeing (+115 percent), and pleasure boating/water skiing (+30 percent) the primary components. Swimming/beach use increased 50 percent while miscellaneous other activities were about 20 percent higher. Conversely, shore fishing declined about 24 percent and boat fishing about 5 percent, apparently in response to reduced runs of American shad, steelhead, and chinook salmon to the upper river in 1980 (Table 13).

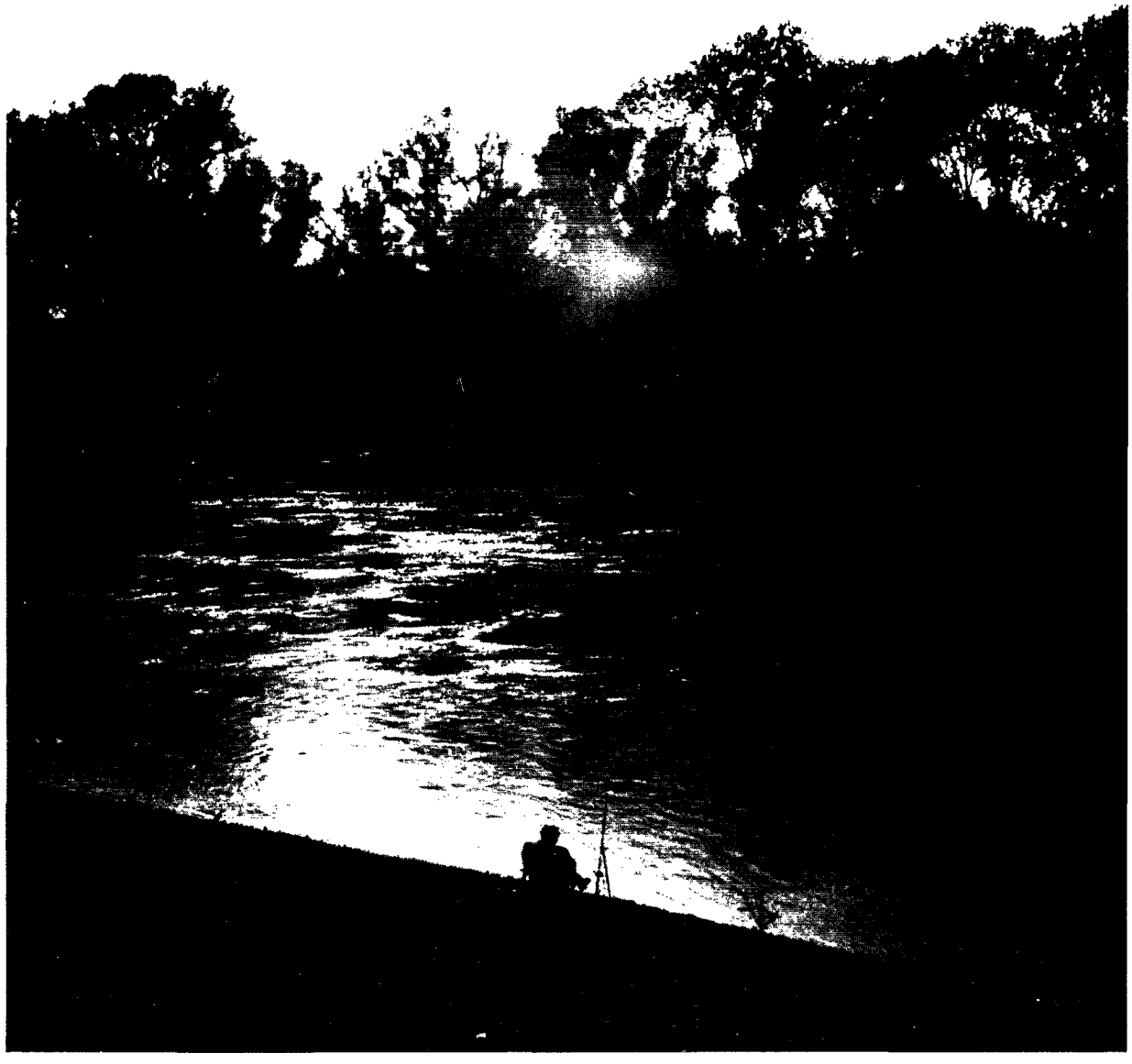
TABLE 13

COMPARISON OF SACRAMENTO RIVER RECREATION, 1973 AND 1980, KESWICK DAM TO COLUSA

Activity (Recreation Hours)	1973	1980	Percent Change
Shore Fishing	330,000	250,000	- 24
Boat Fishing	450,000	429,000	- 5
Swimming/Beach Use	90,000	135,000	+ 50
Rafting/Tubing	56,000	169,000	+200
Canoeing/Kayaking	37,000	79,500	+115
Pleasure Boating/Water Skiing	48,000	62,500	+ 30
Miscellaneous	804,000	960,000	+ 20
Totals	1,815,000	2,085,000	+ 15

In 1977-78, the Department of Water Resources hired consultants to conduct the Delta Outdoor Recreation Survey. The purpose of the survey was to update previous Delta recreation studies on existing and future recreation. Data collected for this study indicated that about 3.5 percent of the Delta visitors and 4.4 percent of the Delta residents used the Sacramento River from Freeport south to Courtland (Cajucom and Associates, 1980). This would indicate about 420,000 recreation days were spent on that reach of the river in 1977-78.

By comparison, in 1980 Reach 13 (Miller Park to Paintersville Bridge) had about 260,000 recreation days. It is impossible to reconcile the difference between these estimates because totally different survey techniques were used and the surveys were made in different years. However, both estimates are subject to error and the combined potential errors for these estimates could easily account for a difference of this size.



ACKNOWLEDGEMENTS

Surveying recreation along 433 km (269 mi) of river for one year and compiling the resulting mountain of data was a major undertaking requiring the intermittent efforts of nearly 50 people over a two-year period. The survey began early in 1980 when the first use counts and interviews were made. The pace increased as spring turned into summer and the quantity of data mushroomed. Graduate student assistants Kathi Karish and Sharon Haines coordinated the early surveys, compiled the data, and set the stage for those who followed. Later, student assistants Tonni Crippen and Mary Chadwick waded through survey forms that piled higher all summer. By fall, graduate student assistants Jerry Tittle and Joan Cherron finally began to catch up with the data. Jerry checked and summarized hundreds of pages of counts and prepared the final estimates of use. Joan worked many hours checking interview data and developing a computer program to store and analyze over 3,700 interviews. Later, student assistant Jerry Magnuson summarized several hundred creel census forms and estimated the numbers of fish caught.

Many people helped on the 33 river survey days. Some were hired for the job, others were "borrowed" from their normal tasks. All deserve thanks for working the long days necessary to conduct a survey of this type.

Department of Fish and Game biologists Charlie Brown, Ray Schaffter, and Nick Villa led a crew of ten Department of Fish and Game aids who helped conduct many of the upper river surveys. These included Olson Mefford, Ron Beane, Alice Wong, Vance McGowen, Dan Miles, Lynn Thompson, Alex Gonzalez, Robbie Peterson, Joetta Barkley, and Randy Vance.

Department of Water Resources geologists Dennis Parfitt, Jack McMillan, Laura Germain, and Brian Lewis, and student assistants Jan Haney and Doug Rawlston also helped on several surveys, especially in the spring and fall months when student help was short.

Department of Water Resources planners Charlie Pike and Mike Cooney coordinated the lower river surveys near Sacramento. Student assistants Dave LaBrie and Art Godwin worked most of the survey days. Department of Water Resources engineers Jack Choy, Joe Nardella, John Fraley, Scott Jersich, and student assistants Don Hatch, Glenn Kobata, and Ken Murray also helped conduct many of the lower river surveys. Department of Boating and Waterways employees Gerry Willmett, Lupe Rios, Ben Maestas, Al White, Shelley Spindler, and Edie Adams also helped on several survey days.

Finally, considerable appreciation is due pilots Steve Heinle and Dan Fregin of Wes-Martin Aviation in Red Bluff, who positioned the airplane countless times so people along the river could be counted. Their skill and patience made the aerial counts possible.

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APPENDICES A - F

APPENDIX A

DESCRIPTION OF SACRAMENTO RIVER REACHES

REACH 1 - Keswick Dam to North Street Bridge in Anderson
(*RK 486 to 457) (**RM 302 to 284)

The river's current is rapid here as it twists through rugged foothills of volcanic and sedimentary rocks. Below Redding, it runs through gravelly sediment that has less resistance to erosion and forms a wider flood plain. There are high bluffs along the river near Redding. Clear Creek enters the river in this reach.

Average water temperature ranges from 9°C (49°F) in the winter to 11°C (51°F) in the summer. On occasion the temperature may vary considerably from the average. Chemical and physical water qualities are within desirable limits for domestic use and fish and aquatic life. It does deteriorate at times due to sediment from heavy runoff, metal drainage from abandoned mines, and sewage discharge.

Despite increasing urbanization, a few wildlife species, like this young raccoon, live along the river near Redding (DFG photo).

*River kilometres
**River miles, based on USCE "Sacramento River Aerial Atlas", 1980.

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This reach has increasing urban and industrial development, resulting in a decrease in riparian vegetation. Twenty-five percent of the riverside land is given to urban and industrial uses; 15 percent is farmland, and most of the water diverted in this reach is used for irrigation. Sixty percent of the riverbank land is undeveloped and privately owned, except for a few miles in Federal and State ownership.

Recreation facilities include Caldwell Memorial Park, Turtle Bay Recreation Area, and Kutras Park. Fishermen have five fishing access areas and an RV park for camping.

Fishing is excellent in this reach. About 20 percent of all salmon spawning in the river spawn above Anderson. Steelhead trout, sturgeon, squawfish, sucker, carp, and sculpin are also found. Wildlife populations are limited by human presence, but a few species inhabit the denser vegetation.

Rafters, kayakers, and canoeists are attracted to this area because of the swift currents and riffles. The river is cold and dangerous for swimming throughout the upper reaches, but one still sees occasional swimmers.

REACH 2 - North Street Bridge to Jellys Ferry Bridge (RK 457 to 430) (RM 284 to 267)

In this reach, the Sacramento winds through dense riparian vegetation, steep bluffs, and low sandbars. The flow is clear and fast, with numerous riffles. In places, the river encounters exposed layers of sandstone that are fairly resistant to erosion. This reach is noted for its scenic value. Uplands have foothill woodland species or open woods of blue oak. Tributaries include Cottonwood, Cow, and Battle Creeks.

The average water temperature is 9°C (48°F) in the winter and 13°C (56°F) in the summer. Temperatures usually vary only slightly from the average. Water quality is within desirable limits for most purposes, although heavy runoff causes a decline in quality at times.

There are no major diversions, but some water is diverted for domestic supply and irrigation. Urban and industrial land use is concentrated in the vicinity of Anderson. Agriculture is the main land use, but crops rarely extend to the river.

Recreationists find access to the river at Anderson River Park and public boat ramps at Balls Ferry and Reading Island. There are also three fishing access areas and BLM's Jellys Ferry River Access. Most of the reach is private and inaccessible except by boat. Lake California, a recreation-oriented subdivision, is located below Cottonwood Creek. Recreation in this reach is somewhat restricted because of limited public access, cold water, and snags which are hazards to boating.

The public boat ramp near Balls Ferry Bridge is an important access site in Reach 2.

This reach offers excellent fishing and has major spawning areas for chinook salmon below Cottonwood Creek. About 30 percent of all salmon spawning in the river spawn in this reach. Steelhead trout, rainbow trout, and squawfish are also found here. Wildlife and birds are more plentiful than above Anderson.

REACH 3 - Jellys Ferry Bridge to Red Bluff Diversion Dam (RK 430 to 391) (RM 267 to 243)

Below Jellys Ferry Bridge the river winds through bluffs and bottomlands. Table Mountain and Iron Canyon are the most prominent land features. Chinese Rapids, a narrow channel of fast, turbulent water, is just above Iron Canyon. This mile-long channel is the most turbulent section in the survey area.

Water temperature and quality are similar to the Anderson-to-Jellys Ferry reach.

There are no significant water diversions in this reach. Most of the riverside land is used for cattle grazing, and remains undeveloped. Land near Red Bluff has been developed for residential, urban, and industrial uses. Where natural vegetation is missing, the development is obvious.

Most of this reach is privately owned. The Bureau of Land Management operates a large public access area above Bend Bridge. Other public recreation facilities are at Ide Adobe State Historical Monument, Dog Island access, Red Bluff Marina and River Park, and Red Bluff Diversion Dam. Bend Bridge also offers fishing access, and there are several RV parks in this reach.

This scenic reach offers quality fishing and a variety of wildlife. Recreation limitations include snags and cold water.

River otter are common inhabitants of the Iron Canyon area above Red Bluff (DFG photo).

REACH 4 - Red Bluff Diversion Dam to Woodson Bridge
(RK 391 to 351) (RM 243 to 218)

Below Red Bluff the river cuts through wide flood plains and riparian thickets. Because of easily erodible soils and the meandering nature of the river, the adjacent setting is constantly changing. Tributaries entering this reach include Antelope, Thomes, Mill, Elder, and Deer Creeks. The river is moderately fast flowing and the water is usually clear.

Water temperature ranges from 9°C (48°F) in the winter to 15°C (59°F) in the summer. The temperature varies slightly in the winter, and several degrees in the summer. Chemical and physical water qualities are within desirable limits for most purposes. From Redding to Tehama the river supports organisms characteristic of clean water. Below Tehama the river supports a lower level of bottom organisms which may indicate a gradual decline in water quality, but could be caused by the changing riverbed.

Most of the land immediately along the riverbank is undeveloped, although in some locations natural vegetation is in narrow strips, screening agricultural land. Except for the small city of Tehama, urban development is sparse. Most of the land is privately owned, and river is diverted almost exclusively for irrigation.

This reach offers fishing access at Red Bluff Diversion Dam and public access at Woodson Bridge State Recreation Area, two county parks, and seven private resorts, trailer parks, and marinas.

The mouth of Deer Creek near Woodson Bridge State Recreation Area was a popular spot for salmon fishing in 1980.

Chinook salmon and American shad most frequently spawn in this reach, although a small number of striped bass and sturgeon also spawn here. Oxbow lakes and sloughs support warmwater fish, including smallmouth bass, crappie, catfish, and bluegill.

Generally this reach is safe for small boats, although snags and shallows can be hazardous.

REACH 5 - Woodson Bridge to Hamilton City Bridge (Gianella Bridge) (RK 351 to 320) (RM 218 to 199)

Large sandbars and dense riparian forests line the riverbanks along this reach. In a few places, crops are planted to the river or fields are visible through thin strips of vegetation. The river flows moderately fast and there are several riffles.

Water temperature and quality are similar to the Red Bluff-Woodson Bridge reach.

Much of the land along the river is undeveloped and privately owned. Agriculture is the predominant land use. There are only scattered houses. Other than the county park at Woodson Bridge, recreation access is restricted by private land.

Fish spawning in this reach include shad, a few salmon, striped bass, and sturgeon. Smallmouth bass, crappie, catfish, and bluegill are found in the oxbow lakes and sloughs along the river.

REACH 6 - Hamilton City Bridge to Sidds Landing (RK 320 to 286) (RM 199 to 178)

The Sacramento River winds through flat terrain with little development along this reach. Because of easily erodible banks and the swift currents, parts of the reach have been leveed; however, the levees are located away from the immediate river environment. Occasionally field and orchard crops encroach upon the thick natural vegetation lining the banks. Stony and Big Chico Creeks empty into the Sacramento in this reach.

The upper part of this reach has a cooler water temperature in the summer (15°C--59°F) than the lower stretch of the reach (18°C--64°F). The average winter temperature is 9°C (48°F). Water quality is within limits for domestic use and aquatic life.

Development along this reach is scant. Most of the land is privately owned and used for agriculture. Water is diverted primarily for irrigation.

Bidwell River Park, Shannon Slough Wildlife Area, Ord Ferry Park, and Jacinto Wildlife Area offer scenic recreation sites. There are also three private resorts.

Navigability is good for recreational craft, although there are numerous snags. Tubing is very popular in summer, and Hamilton City Bridge is a common starting point. Stairs to accommodate tubers were constructed in 1980 at the "Washout", which is near Chico Landing in Bidwell River Park.

Tubing is the major recreation activity in Reach 6.

REACH 7 - Sidds Landing to Hamilton Bend
(RK 286 to 240)(RM 178 to 149)

Broad levees with scattered orchards and pockets of riparian vegetation line the riverbanks along this reach. Levees are located some distance from the river, so the river continues to meander and is only occasionally constrained by the levee system.

Water temperature is similar to Reach 6, but water quality is somewhat worse. Agricultural drainage is the major source of waste water and contributes to the lower water quality.

Virtually all of the water diverted is used for irrigation. The primary land use between levees is agricultural. Butte City and Princeton are the major communities along this reach. Both towns are located outside the levee, and thick riparian vegetation generally hides them from view. The Princeton Ferry is the last operating ferry on the upper river. Moulton Weir diverts floodwaters from the river into Butte Basin and Sutter Bypass about 23 km (14 mi) north of Colusa. The weir is set back and not visible from the river.

The last operating river ferry crosses the river at Princeton.

Recreation access in this reach is limited by private property. Primary access is by boat from resorts upstream and downstream, although there is access to the river on State-owned property (Site 21), and two access sites across private property at Butte City and Princeton Ranch.

Fishing is enjoyed throughout the year. Navigation for small boats is good, although there are many snags. Wildlife, especially bird-life, is frequently seen along this reach. King salmon and steelhead trout migrate through this reach to spawning grounds above Ord Ferry. A number of striped bass, American shad, and sturgeon spawn here.

REACH 8 - Hamilton Bend to Meridian Bridge (RK 240 to 216) (RM 149 to 134)

The river slows and becomes increasingly murky in this reach. In the upper part of the reach, the levees are away from the river and native vegetation and orchards line the banks. The levee berm narrows in the lower part of the reach, leaving barren areas and scraps of vegetation. Sutter Buttes can be seen in the distance at several locations.

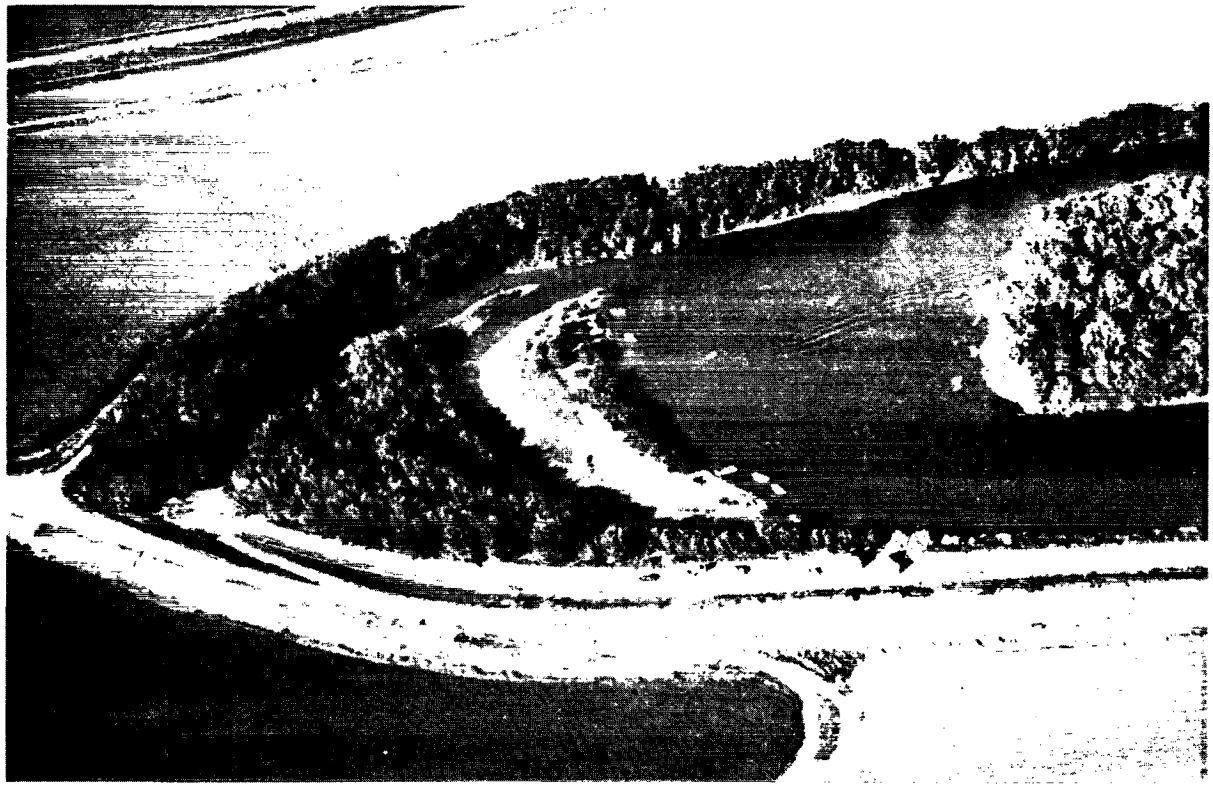
Water temperature averages 9°C (48°F) in the winter and 20°C (68°F) in the summer. Chemical and physical water qualities are within desirable limits for most purposes, but water quality declines compared to more northerly reaches, because of agricultural drainage. Butte Creek empties into the Sacramento in this reach.

Water is diverted mainly for irrigation and a small amount for domestic use. Agriculture is the main land use, and the only urbanized area is the town of Colusa. Private land ownership is predominant.

Recreation areas include Colusa-Sacramento River Recreation Area, Colusa Weir access, and privately owned resorts and fishing access. This reach is good for boating and recreation facilities are geared toward that. Fishing, water-skiing, camping, and swimming are also popular.

REACH 9 - Meridian Bridge to Eldorado Bend (RK 216 to 159) (RM 134 to 99)

This reach is flat, and the levee system closely borders the river. Riparian vegetation is limited to thin strips along the banks. Land beyond the levees is used for crops and is privately owned. The only developments are the small towns of Meridian and Grimes.



An undeveloped island at Poker Bend is used for camping, water skiing, beach use, and fishing.

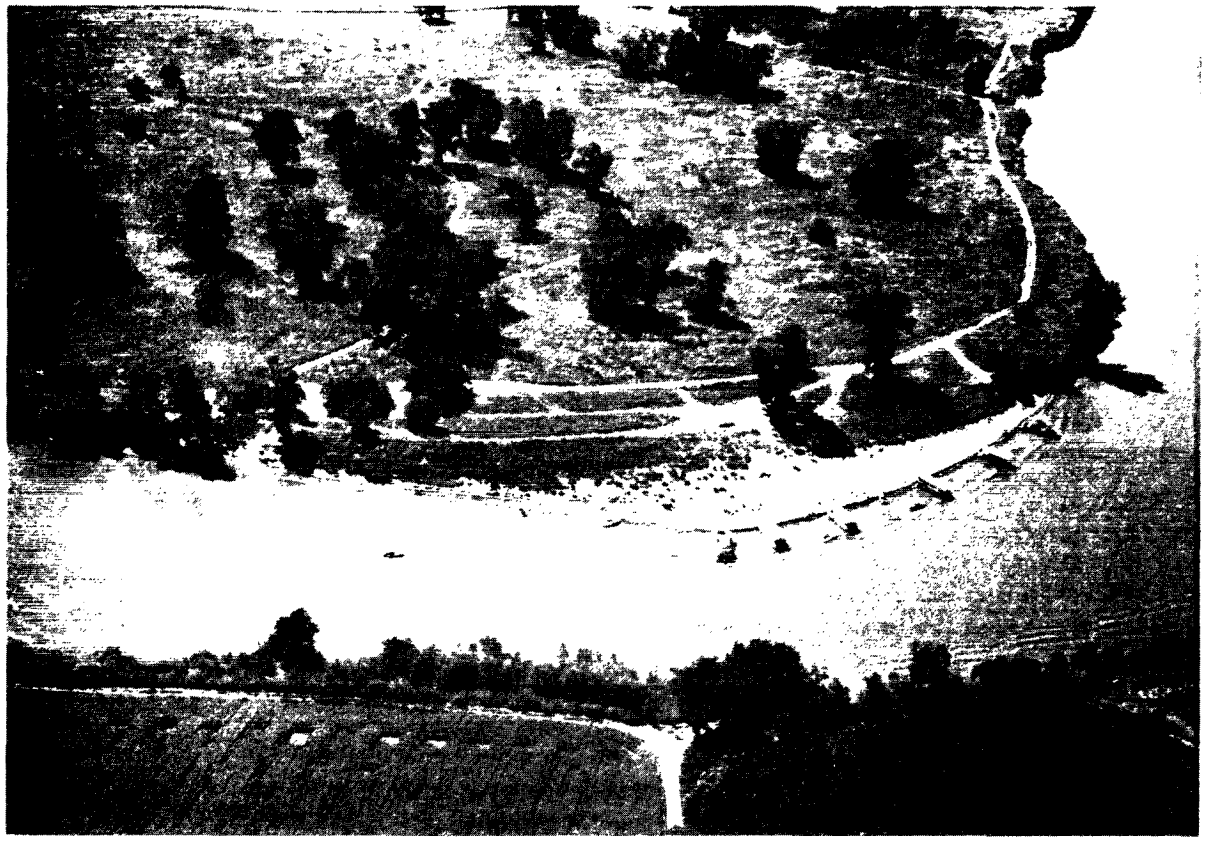
Water temperature and quality are similar to Reach 8.

There is access to the river on State-owned property at Tisdale Weir and two privately owned access sites. River Bend Public Boating Facility was under construction in 1980. Camping and boat slips are provided at a privately owned boat landing.

Boating is good in this reach, and fishing is enjoyed throughout the year. Shad and sturgeon spawn here. King salmon and steelhead migrate through the area to the upper Sacramento and its tributaries.

REACH 10 - Eldorado Bend to Mouth of Feather River
(RK 159 to 129) (RM 99 to 80)

This reach is similar to Reach 9, but the adjacent lands are less developed and there are no levees along either bank for about 6.4 km (4 mi) where Sutter and Yolo Bypasses meet. Stands of vegetation are more extensive. The river remains slow moving and muddy.



Fremont Weir is popular for fishing in the spring and for water skiing and beach use in the summer.

Average water temperature is 9°C (48°F) in the winter and 20°C (68°F) during the summer. The minimum/maximum temperature range is 7°C (44°F) in winter to 22°C (72°F) for summer.

Land use beyond the levees is agricultural. The community of Knights Landing is located in this reach.

There are several access areas on State and privately owned property. Knights Landing provides camping facilities and boat docks. Recreation is oriented to boating and boat-related activities that benefit from the good navigability in this reach. Shad, sturgeon, and striped bass spawn here. Smallmouth bass, crappie, catfish, and bluegill are also common.

REACH 11 - Feather River to Discovery Park (RK 129 to 97) (RM 80 to 60)

The river continues its slow movement through flat land and leveed banks. The confluence of the Feather River increases the width and volume of the river, but the flow is still relatively slow, with no riffle areas or islands. A thin band of natural vegetation remains along both banks except where bank protection, orchards, or commercial developments exist. There are many residences in this reach, but riparian vegetation screens them from view. Urban development is more apparent as the river nears Sacramento. The town of Bryte is adjacent to the river.

Sacramento Bypass offers access to the river on State property. Recreation facilities are provided at several private marinas and the Elkhorn Boating Facility.

REACH 12 - Discovery Park to Miller Park (RK 97 to 92) (RM 60 to 57)

The river environment along this reach has been drastically transformed by human activity. The river is slow, murky, and enclosed by levees on both banks. Urban and industrial development that form the City of Sacramento surround the river. Riparian vegetation shrinks to a few patches and wildlife has dwindled with the vegetation. The American River, a major tributary, enters the Sacramento in this reach.

Recreation facilities include Discovery Park, Broderick Boating Facility, Miller Park, and several private landings.

The boat ramp at Discovery Park is the most heavily used launching site on the river.

REACH 13 - Miller Park to Paintersville Bridge, Below Courtland (RK 92 to 53) (RM 57 to 33)

Leveed banks constrain the river throughout this reach. The upper 10 km (6 mi) is primarily devoted to urban and industrial development. Agriculture is the predominant use on both banks through the lower stretch of the reach. The terrain is flat and there are no islands or riffles. Below Sacramento County the only developments are the small towns of Clarksburg and Courtland.

There is a variety of recreation facilities in this reach. Garcia Bend Park and Clarksburg Public Fishing Access provide boat ramps and there are several privately owned landings and marinas.

Fishing is good year-round. Large numbers of American shad, sturgeon, and striped bass move through this reach during spawning migrations and largemouth and smallmouth bass, crappie, catfish, and bluegill are year-round residents.

APPENDIX B

INVENTORY OF ACCESS SITES AND FACILITIES, SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE NEAR COURTLAND, 1980

This inventory of Sacramento River recreation facilities and access sites was developed as part of the survey of recreation use conducted during calendar year 1980. The inventory lists developed sites open to the general public and undeveloped sites receiving significant public use. It does not include access sites at private residences, private organizations or clubs, or mobile home parks which do not cater to "overnighters". "Significant public use" is rather loosely defined as more than only occasional use by a few individuals. There are many additional sites which are occasionally used by one or two people or which have potential for recreation use. These sites receive little or no use because access is inconvenient or the site is not desirable for specific kinds of recreation. People tend to use the river where access is convenient from home and where road access is close to the actual use site. Recreationists are rarely seen more than one-fourth or one-half mile from their vehicle or boat.

The site names are "official", locally used, or, in a few cases, made up for this inventory. The river miles refer to those used on U. S. Geological Survey maps and in the U. S. Army Corps of Engineers' "Sacramento River Aerial Atlas, 1980". The operating agency refers to the level of government responsible for the site. Many of the sites are owned or operated by private individuals or businesses. Public use at these sites is by fee, with the permission of the owner, or by trespass at several locations. The facility inventory (camping, picnicking, boat ramp or hoist, and boat docks or slips) refers to facilities available at the sites, not necessarily activities occurring there. It is possible to picnic at nearly all of these sites, and to camp at many of them. Cartop boats, canoes, and small trailered boats are launched at many sites not having boat ramps. Camping facilities are marked RV for sites suitable primarily for recreation vehicles, and X when both tent and RV camping are possible, although the latter sites may not be attractive for tent camping. Snack bars and other dining facilities are available at many marinas and resorts but are not indicated in the inventory. Boat docks and slips refer to docks intended for extended berthing, for several hours, days, or months. This listing does not include small docks at boat ramps used for launching boats but not for boat storage.

There have been several changes in facilities and access sites since 1980. These are not shown in this inventory. It lists facilities and sites in use during the 1980 survey.

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
KESWICK DAM TO ANDERSON - Reach 1						
Keswick Dam Tailwater	302.0R	Federal				
Caldwell Memorial Park	298.5L	City		X	R	
Turtle Bay Recreation Area	297.5R	City		X	R	
Turtle Bay East Fishing Access	296.2L	City				
Kutras Park	295.8R	Private		X		
Marina Trailer Park	295.2R	Private	RV		R	
Cypress Street Fishing Access	295.0R	Private				
South Bonnyview Bridge River Access	292.0R	Private				
Cascade Community Park (proposed)	289.6R	City				
Mouth of Clear Creek Fishing Access	289.2R	City				
Crest Island	287.8L	State				
Anderson Fishing Access	284.2R	City			R	
ANDERSON TO JELLYS FERRY BRIDGE - Reach 2						
Anderson River Park	283.0R	City		X	R	
Haas Island	281.5R	State				
Deschutes Bridge Fishing Access	280.8R	Private				
Cow Creek Island	280.2L	State				

(a) L = Left Bank, R = Right Bank (looking downstream)

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
ANDERSON TO JELLYS FERRY BRIDGE - Reach 2 (Cont.)						
Balls Ferry Fishing Resort	276.2R	Private	X		R	X
Roosters Landing	276.2L	Private	X			X
Balls Ferry Fishing Access and Park	276.1L	County		X	R	
Reading Island Fishing Access	274.0R	Federal	X	X	R	
Battle Creek River Access	271.0L	State				
Laurence Riffle Trailhead	270.4L	Private				
Laurence Island	269.4R	State				
Jellys Ferry River Access	266.8L	Federal		X		
JELLYS FERRY BRIDGE TO RED BLUFF DIVERSION DAM - Reach 3						
Sacramento River-Paynes Creek Recreation Area	261.0L	Federal				
Bend Bridge Fishing Access	257.7L	County		X	R	
Bend Mobile Home Park	257.6R	Private	X			X
Surrey Village River Access	248.1R	Private				
Rio Vista Mobile Estates	247.8L	Private	X	X		X
Ide Adobe Historic Monument	247.0R	State		X		X
Dog Island Park and Fishing Access (Samuel Ayer Park)	245.9R	City		X		
River Marina	245.8L	Private			R	
Red Bluff Trailer Park	245.3L	Private	X			X
O'Nite Park	245.1L	Private	X			

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
JELLYS FERRY BRIDGE TO RED BLUFF DIVERSION DAM - Reach 3 (cont.)						
Red Bluff River Park and Fishing Access	245.1R	City		X	R	
Red Bluff Marina (The Galley)	244.9R	Private				X
East Sand Slough Water Ski Area	244.6L	Federal				
Red Bluff Diversion Dam (above dam)	243.0L	Federal	X	X	R	
RED BLUFF TO WOODSON BRIDGE - Reach 4						
Red Bluff Diversion Dam (below dam)	242.9L	Federal	X	X	R	
Altube Island	242.5R	Federal				
Bow River Mobile Home Park	238.9L	Private	X		R	X
Todd Island	237.0L	Federal				
Hunter's Mobile Home Park	236.0L	Private	RV		R	X
Sacramento Bar Fishing Access	235.3L	Private				
Antelope Creek Mobile Home Park	232.5L	Private	X		R	X
North Fork Mill Creek Fishing Access	231.2L	County-State				
Hidden Harbor Mobile Home Park	229.8L	Private	X	X		X
Mouth of Mill Creek Fishing Access	229.7L	County		X	R	
Ditter's River Inn	229.6L	Private	X			X
Driftwood Fishing Resort	229.5L	Private	X	X		X
Pelham's Bay Resort	229.4L	Private	X	X		X
Copeland Bar Island	221.0L	State				

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INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
RED BLUFF TO WOODSON BRIDGE - Reach 4 (cont.)						
Woodson Bridge Recreation Area	219.0L	State	X	X		
Tehama County River Park	218.2L	County		X	R	
Riverside Sportsmen's Resort	218.1L	Private	X	X		X
WOODSON BRIDGE TO HAMILTON CITY BRIDGE - Reach 5						
Merrill's Landing Wildlife Area	213.5R	State				
Foster Island	210.5R	Federal				
River Marina	199.5L	Private	RV			
Gianella Bridge River Access	199.3R	Private				
HAMILTON CITY TO SIDDS LANDING - Reach 6						
Mouth of Pine Creek Wildlife Area	197.0L	State				
Pine Creek Landing	196.5L	Private	X		R	X
Scotty's Boat Landing	196.0L	Private	X		R	X
Bidwell River Park	194.5L	CARD (b)		X	R	
Big Chico Creek Area	193.5L	CARD (b)				
Shannon Slough Wildlife Area and Fishing Access	187.3R	State				
Ord Bend Park	184.3R	County		X	R	
Jacinto Wildlife Area and Fishing Access	181.5R	State				
Hawaiian Gardens Resort	180.0R	Private	X		H	X

(b) Chico Area Recreation District

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
SIDDS LANDING TO HAMILTON BEND - Reach 7						
Butte City River Access	169.5L	Private				
Site 21 Fishing Access	165.5R	State/County				
Princeton Ferry	164.3R	County				
Princeton Ranch Fishing Access	163.2R	Private				
Moulton Weir Fishing Access	158.1L	State				
HAMILTON BEND TO MERIDIAN BRIDGE - Reach 8						
Colusa Weir River Access	146.0L	State				
Cruise 'N Tarry Marina	145.7L	Private	X		R	X
Colusa-Sacramento River Recreation Area	144.3R	State	X	X	R	X
Ralph's Steelhead Lodge	142.6L	Private	X		H	X
Locvich Bar Fishing Access	142.4L	Private				
Moon's Bend Water Ski Beach	138.8R	Private				
Ward's Boat Landing	138.2L	Private	X		R	X
Bob and Pat's Landing	137.0L	Private	X		H	X
MERIDIAN BRIDGE TO ELDORADO BEND - Reach 9						
Gravel Point Fishing Access	129.0L	Private				
Grimes Boat Landing	124.4R	Private	X		H	X
Tisdale Weir Fishing Access	118.7L	State				

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INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
MERIDIAN BRIDGE TO ELDORADO BEND - Reach 9 (cont.)						
Poker Bend Island	105.9R	State				
Little Poker Bend Fishing Access	103.5L	Private				
ELDORADO BEND TO FREMONT WEIR - Reach 10						
Eldorado Bend Fishing Access	98.6R	Private				
Missouri Bend River Access	96.9R	Private				
Missouri Bend Fishing Access	96.6L	Private				
Sutter Recreation Area	93.9L	State/County				
Fourmile Bend Fishing Access	92.8L	Private				
Fourmile Bend River Access	92.5L	Private				
Knights Landing Fishing Access	89.9R	County			R	
Knights Landing Park	89.8R	Private	X			X
Knights Landing Marina	89.8L	Private	RV		H	X
Portuguese Bend River Access	87.8R	Private				
Road 116 River Access	84.7R	Private				
Fremont Weir River Access	83.3R	State				
Fremont Weir River Access	83.1R	State				
Fremont Weir River Access	82.1R	State				
Fremont Weir River Access	81.7R	State				

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
FREMONT WEIR TO DISCOVERY PARK - Reach 11						
Verona Marina	79.6L	Private	X		R	
Joe's Wharf	78.8L	Private	X			X
Rio Ramaza Marina	76.4L	Private	RV		H	X
Alamar Marina	70.8L	Private				X
Metro Marina	70.6L	Private				X
Elkhorn Boating Facility	70.5L	County	X	X	R	
Elkhorn Regional Park	69.5R	County		X	R	
Sacramento Bypass Fishing Access	63.5R	State				
Riverview Marina	61.8L	Private				X
Crawdads River Saloon	60.7L	Private				X
Village Marina	60.6L	Private				X
The River Galley	60.5R	Private				X
Riverbend Marine and Viewpoint Marina	60.4R	Private			H	X
DISCOVERY PARK TO MILLER PARK - Reach 12						
Discovery Park	60.3L	County		X	R	
Tower Bridge Marina	60.0R	Private				X
Broderick Boating Facility	59.8R	County			R	
Marina Inn	59.3R	Private				X
Miller Park (upper)	57.9L	City		X		X

INVENTORY OF RECREATION ACCESS SITES AND FACILITIES, 1980
SACRAMENTO RIVER
KESWICK DAM TO PAINTERSVILLE BRIDGE, NEAR COURTLAND

Facilities	River Mile(a)	Operating Agency	Camping	Picnicking	Boat Ramp or Hoist	Boat Docks, Slips
DISCOVERY PARK TO MILLER PARK - Reach 12 (Cont.)						
William G. Stone Navigation Lock Overlook	57.4R	Federal		X		
Sacramento Boat Harbor	57.3L	City				X
Miller Park (lower)	57.2L	City			R	
MILLER PARK TO PAINTERSVILLE BRIDGE - Reach 13						
Captain's Table	55.3L	Private				X
Sherwood Harbor Marina	54.8R	Private				X
Da Rosa Marina	53.9L	Private			R,H	X
Four Seasons Marina	53.6R	Private				X
Minnow Hole	53.6L	State				
Garcia Bend Marina	51.1L	Private				X
Garcia Bend Recreation Area	49.3L	County		X	R	
Light 29	48.1L	Private		X		X
Freeport Marina	46.2L	Private				X
Cliff's Marina	45.3L	Private			H	X
Clarksburg Marina	42.6R	Private			H	X
Clarksburg Public Fishing Access	39.5R	City			R	
Courtland Docks	34.4L	Private				X
Kane's Marina	34.1L	Private				X

APPENDIX C

SACRAMENTO RIVER RECREATION SURVEY SCHEDULE
January 1980 through December 1980

Date	Weekend Weekday Holiday	Survey Stratum	Starting Locations[1]
February 8	WD	I	Keswick
March 15	WE	IV	Verona
March 26	WD	III	Verona
March 29	WE	IV	Keswick
April 9	WD	III	Keswick
April 14	WD	III	Keswick
April 20	WE	IV	Verona
May 2	WD	V	Keswick
May 3	WE	VI	Keswick
May 24	HD	IX	Verona
June 1	WE	VI	Verona
June 10	WD	V	Verona
June 27	WD	V	Keswick
June 28	WE	VI	Keswick
July 8	WD	V	Verona
July 20	WE	VI	Verona
July 26	WE	VI	Keswick
July 29	WD	V	Keswick
August 4	WD	V	Verona
August 9	WE	VI	Verona
August 21	WD	V	Keswick
August 24	WE	VI	Keswick
August 30	HD	IX	Verona
August 31	HD	IX	Keswick
September 6	WE	VIII	Verona
September 19	WD	VII	Verona
September 27	WE	VIII	Keswick
October 2	WD	VII	Keswick
October 25	WE	VIII	Verona
October 27	WD	VII	Verona
November 14	WD	I	Keswick
November 22	WE	II	Verona
December 21	WE	II	Keswick

1/ Starting locations for aerial count.

APPENDIX D

SACRAMENTO RIVER RECREATION USE COUNT INSTRUCTIONS

Each river reach has a number of locations where counts of recreationists can be made from a vehicle or on foot. The idea is to count recreationists in several popular areas within a one-hour period about five times each day. Keeping the use count period within one hour may mean skipping some areas which have little or no use or which are difficult and/or time-consuming to reach.

The five use counts will be made at specific times during the survey day. The second and fourth ground counts can be correlated with two aerial counts made at the same time to estimate hours of use for the day. Downstream from the Feather River only the ground-level counts will be made. In these reaches, it is essential to count all recreation, since the estimates of use will be made directly from these counts.

The surveyor should record the time and numbers of people, vehicles, boats, empty boat trailers, travel trailers, etc., for each area so that an estimate can be made of the number of people using the area during each use count period. These data can be recorded in a notebook or on a form designed for this purpose. The number of people observed taking part in various recreation activities should be noted. Often the people associated with vehicles and/or boat trailers will not be seen because they are out of sight on the river or elsewhere. The counts of vehicles, etc., along with the aerial counts help estimate the number of people missed.

The schedule of use counts will vary with the changing number of daylight hours during the seasons of the year. Starting times for the use counts during each month are shown below. The second and fourth counts are especially critical since they are coordinated with the aerial counts.

Use Count Schedule

Month	PST/PDT	First	Second	Third	Fourth	Fifth
January	PST	0730	0930	1130	1400	1600
February	PST	0730	0930	1200	1430	1630
March	PST	0700	0930	1200	1430	1700
April	PST	0630	0900	1200	1430	1730
May	PDT	0700	1000	1300	1600	1900
June	PDT	0700	1000	1300	1600	1900
July	PDT	0700	1000	1300	1600	1900
August	PDT	0700	1000	1300	1600	1900
September	PDT	0730	1000	1230	1500	1730
October	PDT	0730	1000	1230	1500	1730
November	PST	0700	0900	1130	1400	1600
December	PST	0730	0930	1130	1330	1530

This schedule allows 1 hour for each use count, 2½ (winter) to 5 hours (summer) for interviews and creel census, and 2 to 3 hours for lunch and rest breaks during the survey days. Since an adequate number of interviews (10-17) and creel censuses (10-19) can be obtained in less than 3 hours, there should be time for additional breaks during the long summer survey days.

The use count schedule should be maintained closely, but the specific hours used to obtain interviews and creel census data are flexible at the discretion of the surveyor. Some time each day (possibly just before the fifth count) should be spent at a popular boat ramp to interview and creel census boaters.

California Dept. of Water Resources	RIVER USE SURVEY	RIVER	Day Mo. Yr.	Sheet No.
COMMENTS		REACH	Strata No.	Made By:

SITE CHARACTERISTICS																																							
LOCATION SUB-REACH	TIME START	TIME FINISH	AIR TEMPT.	WEATHER	WATER TEMPT.	FLOW C.F.S.	APPEARANCE OF STREAM	SHORE FISHING	BOAT FISHING	PICNICKING	USING PICNIC FACILITIES	SIGHTSEEING	BEACH USE	SWIMMING/WADING	WALKING FOR PLEASURE	BICYCLE RIDING	MOTORCYCLING	HORSEBACK RIDING	JUST RELAXING	PLEASURE BOATING	WATER SKIING	JET SKIS	CANOEING	RAFTING/INFLATABLE	CAMPING	USING CAMPING FACILITIES	PARTICIPATE IN OUTDOOR GAMES	PHOTOGRAPHY/ PAINTING	HARVESTING(SPECIFY)	JOGGING	OTHER	OTHER	OTHER	OTHER	OTHER	TOTAL PEOPLE COUNT	BOAT TRAILER COUNT	POWERBOAT COUNT	VEHICLE COUNT
TOTAL FOR COUNTING PERIOD																																							

APPENDIX E

SACRAMENTO RIVER INTERVIEW INSTRUCTIONS

Interview Questions

Interview questions are normally directed at the driver of a vehicle. If people are interviewed at a resort, campground, or fishing area, the approach may be modified. A brief introductory statement about conducting a survey should be made before beginning the questions. Usually, the following introduction is sufficient. "We are making a brief survey of recreational use. Do you mind if I ask you a few questions?"

1. Number of Persons in Vehicle: "How many of you are in the vehicle?" If the number appears obvious, "there are # of you in your vehicle?" Be sure to ask. Do not depend on the number you can readily see. It is easy to overlook small children or passengers in a pickup camper or other recreation vehicle. If the person is not in a vehicle, ask "How many came in your vehicle?" Don't confuse the number of people in the "party", which may include two or more vehicles with the number of persons in a vehicle.

2. Type of Use: Indicate the appropriate category of use for each party, using D, E, or S in column 23.

   D - Destination: For Day Use: The party leaves from and returns to their permanent residence on the same day. For Overnight Use: The party's primary overnight destination of the trip.

   E - Enroute: The party is making a stop enroute between their departure and destination points. The stop is not the primary destination of the trip.

   S - Staying in Area: The party is spending more than 1 day in the vicinity of the area being surveyed, perhaps at the nearby park, motel, relative or friend's home, etc. (Day use at area surveyed). Exactly what constitutes "staying in the area" is a judgment decision.

3. Duration of Visit: Ask, "Are you going to stay overnight?" If the answer is "yes" ask, "How many nights will you be staying here?" Determine the number of nights and add one (thus, the minimum entry is two). Record the number of days (nights plus one) in columns 24-25, "camping on project". Parties staying in the general area, but not at the survey location, should be recorded in columns 26-27, "Staying in Area". Record the number of days, again the minimum entry is two. For parties staying in the general area, record both number of days and number of hours at the survey location that day.

   If the person indicates day use, ask: "How many hours are you going to stay?" This question will get a variety of answers but explore and determine as accurately as possible the intended length of stay. Record in columns 28-29 in 1-hour increments; the minimum entry for day-use visitors is one. People who live there are day-users.

4. Camping Overnight Accommodations: Indicate by "X" in columns 30-35 the type(s) of camp vehicles or facilities used by the recreationist:

vacation trailer, tent or folding trailer, pickup camper, motor home (includes van or bus camper), tent, or sleeping out with no shelter (includes sleeping in car).

5. Place of Overnight Accommodations: Some are obvious, such as those camping at the recreation area, but the question, "What overnight accommodations are you using?" must be asked for those "Staying in area". Enter "X" in the appropriate columns (36-41): Motel/Resort, Private Campground, Public Park/Campground (State, Federal, Local), Friends or Relatives, Cabin or Summer Home, or Other.

6. Now go to columns 45-57 and inquire about activities. Ask, "How many of you are going to .... (name each activity and record the number of persons in the vehicle planning to take part). Don't assume that all the group will take part in an activity just because some do. There are three blank spaces at the beginning of "Recreational Activities" block: these are to be used at the interviewer's discretion for such activities are Hunting, Nature Study, Playground Use, Photography, Painting, Hiking, Back Packing, etc. The latter activities are defined at the end of the instructions under "Additional Activities".

   a. Picnicking - Indicate the number of people who have brought a prepared meal or lunch they are planning to eat, whether on shore or in a boat. Persons camping should not be shown as picnicking unless they are using a designated picnic area outside of their campground. A thermos of coffee or a six-pack of beer is not a picnic. Mark the number of people in column 45.

   b. Using Picnic Facilities - Any use of tables, stoves, or other facilities provided for this purpose (but not campers using their campsite facilities). Use of picnic facilities can occur without a picnic. Mark the number of people in column 46.

   c. Sightseeing - Any passive viewing of the scene by any member of a recreation party. This category also includes those parties driving through a recreation area just to take a look around. Does not include viewing the scenery while driving to and from the survey site. Mark the number of people in column 47.

   d. Beach Use - Use of the beach for activities such as sunbathing, picnicking, or various games. Does not necessarily include swimming and/or wading. Mark the number of people in column 48.

   e. Swimming/Wading - Those who are going into the water to swim or wade. Mark the number of people in column 49.

   f. Walk for Pleasure - Less than 2 miles done voluntarily for pleasure and does not include necessary walking such as that done to carry picnic gear or use restrooms. Mark number of people in column 50.

   g. Bicycle Riding - Using non-motorized cycles (uni, bi, or tri). Mark number of people in column 51.

   h. Motorcycling - Using motorized cycles for recreation riding. Mark number of people in column 52.

i. Horseback Riding - Anyone riding a horse for recreation. Mark number of people in column 53.

j. Just Relaxing - This category is intended for those who do nothing but "sit around". Mark number of people in column 54.

k. Water Skiing - Those who are actually going to waterski. Observers are pleasure boating. Mark number of people in column 55.

l. Pleasure Boating - Those people who will participate in one of the following: Motor boating, Sailing, Kayaking, Canoeing, Rafting, or Boat fishing. Mark the number of people in column 56, and put an "X" in the appropriate box under "Type of Boating" in columns 69-75. Also mark the appropriate box in columns 63-68 for "Type of Boat": Trailered Boat, Rental Boat, Cartop Boat, Canoe/Kayak, Moored Boat, or other.

m. Fishing - Indicate in column 57 the number of people planning to fish and determine what they are fishing for. Record in columns 58-62 with an "X". Salmon, Steelhead, Trout, Shad, Bass/Crappie/Bluegill, Catfish, or Other are examples of the types of fishing which may be recorded.

Additional Activity Definitions

a. Nature Study - Any identification of plants or wildlife as to species; any geological investigation, incorporating scientific techniques. Just looking at trees or deer does not constitute nature study.

b. Photography - Anyone taking pictures in an artistic endeavor.

c. Painting/Sketching - Anyone painting or sketching in an artistic endeavor.

d. Playground Use - Anyone using a playground within a recreational area.

e. Hunting - This category is for hunters who use a park or recreational area as a headquarters for hunting activities.

f. Back Packing/Hiking - Over 2 miles of a "more strenuous nature" than just walking or strolling and often includes carrying of food or overnight gear.

6. Special Equipment - Other: Indicate any other special equipment the recreationist has with him using an "X" in columns 76-80. This includes bicycles, motorbikes, dune buggies, all-terrain vehicles.

Note: If the recreationist is not contacted as he enters the area, and his equipment is not visible at the time of the interview, questions 3 to 5 can be handled by asking, "Do you have any special recreation equipment with you, such as boat, camper, vacation trailer, tent, bicycle, or off-road vehicles?"

State of California — DEPARTMENT OF WATER RESOURCES — The Resources Agency

Recreation Use Survey

DATE: DAY __ MONTH __ YEAR __ | SURVEY AREA | INTERVIEW SITE

STRATA NO. | WEATHER | START OF PERIOD | END OF PERIOD | MADE BY: | WEEK END | WEEK DAY | SHEET NUMBER

COMMENTS:

- LINE NUMBER
- NUMBER OF PERSONS IN VEHICLE
- USE TYPE-CODE 1
- DURATION OF VISIT
  - OVERNIGHT (No of Days): STAYING AT RIVER; STAYING IN AREA
  - DAY USE (Number of Hours)
- CAMPING OVERNIGHT ACCOMODATION: TRAVEL TRAILER; TENT TRAILER; PICKUP CAMPER; MOTOR HOME /VAN/BUS; TENT; SLEEPING OUT /CAR/BOAT
- PLACE OF OVERNIGHT ACCOMODATION: MOTEL / RESORT; PRIVATE CAMPGROUND; PUBLIC PARK /CAMPGROUND; FRIENDS OR RELATIVES; CABIN OR SUMMER HOME; OTHER
- RECREATIONAL ACTIVITIES: SHORE FISHING; BOAT FISHING; PICNICKING; USING PICNIC FACILITIES; SIGHTSEEING; BEACH USE; SWIMMING/WADING; WALKING FOR PLEASURE; BICYCLE RIDING; MOTORCYCLING; HORSEBACK RIDING; JUST RELAXING; WATER SKIING; PLEASURE BOATING
- TYPE OF FISHING: SALMON; STEELHEAD; AMERICAN SHAD; STRIPED BASS; TROUT
- TYPE OF BOAT: TRAILERED BOAT; RENTAL BOAT; SAIL BOAT; CANOE / KAYAK; BOAT MOORED; RAFT (Other Inflatables)
- TYPE OF BOATING: MOTOR BOATING; SAILING; KAYAKING; CANOEING; RAFTING; BOAT FISHING; OTHER
- SPECIAL EQUIPMENT: BICYCLE; MOTOR BIKE; DUNE BUGGY; ALL TERRAIN VEHICLE; OTHER
- SPECIAL QUESTIONS: LARGE OR SMALLMOUTH BASS; CATFISH; ANYTHING; OTHER (specify)
- PLACE OF RESIDENCE (COUNTY AND ZIP CODE)

Line numbers: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17

Card columns: 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

DWR 3927 (Est. 6/80)

CODE 1-USE TYPE
D- Destination E-Enroute S- Staying in Area

April 4 1974

C-069371

APPENDIX F

SACRAMENTO RIVER
CREEL CENSUS INSTRUCTIONS

1. Use one census form each day for each river area (1-12) (see Recreation Interview Instructions). "Water" is simply the Sacramento River.

2. If you observe no anglers during the day simply fill out the headings on the form and record "no anglers observed" on the first line at the end of the day.

3. Record a brief description of weather and any unusual water conditions, i.e. turbid, foam, etc.

4. Fill out the form completely for each census, i.e. Number of Anglers, County of Residence, Hours Fished (to nearest 1/4 hour), Total Hours Fished, Species of Fish (Refer to descriptive material and abbreviations below), Length of Fish (to nearest 1/2 cm), and time of census.

5. Make special effort to census boat anglers. Try to spend some time at a popular boat ramp before or after the last use count each day to census a few boat anglers. Use a separate form for boat anglers or be sure to indicate "Boat" in the margin to separate boat anglers from shore anglers.

6. Try to get completed efforts and be sure to asterisk (*) each one.

ABBREVIATIONS FOR NAMES OF FISHES

Common Name	Scientific Name	Abbreviation
American shad	Alosa sapidissima	AS
Chinook salmon	Oncorhynchus tshawytscha	CS
Rainbow trout	Salmo gairdneri	RT
Steelhead	S. g. gairdneri	SH
Carp	Cyprinus carpio	CP
Sacramento squawfish	Ptychocheilus grandis	SQ
Channel catfish	Ictalurus punctatus	CCF
White catfish	Ictalurus catus	WCF
Brown bullhead	Ictalurus nebulosus	BB
Black bullhead	Ictalurus melas	BLB
Striped bass	Morone saxatilis	SB
Smallmouth bass	Micropterus dolomieui	SMB
Largemouth bass	Micropterus salmoides	LMB
Green sunfish	Lepomis cyanellus	GSF
Bluegill	Lepomis macrochirus	BG
White crappie	Pomexis annularis	WCR
Black crappie	Pomoxis nigromaculatus	BCR

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

CREEL CENSUS FORM

Stream or Lake _____ Date _____

Area _____ Checker _____

Indicate Angler Type (Boat or Shore) and Completed Effort (*) in Margin

Weather and Remarks _____

NUMBER IN PARTY	COUNTY OF RESIDENCE	HOURS FISHED (NEAREST ¼)		INDICATE FISH SPECIES (ABBREVIATION) AND FORK LENGTH (NEAREST ½ CM)							TIME
		EACH	TOTAL								
TOTALS											

DWR 3909

C—069373

C-069373

CONVERSION FACTORS

Quantity	To Convert from Metric Unit	To Customary Unit	Multiply Metric Unit By	To Convert to Metric Unit Multiply Customary Unit By
Length	millimetres (mm)	inches (in)	0.03937	25.4
	centimetres (cm) for snow depth	inches (in)	0.3937	2.54
	metres (m)	feet (ft)	3.2808	0.3048
	kilometres (km)	miles (mi)	0.62139	1.6093
Area	square millimetres (mm^2)	square inches (in^2)	0.00155	645.16
	square metres (m^2)	square feet (ft^2)	10.764	0.092903
	hectares (ha)	acres (ac)	2.4710	0.40469
	square kilometres (km^2)	square miles (mi^2)	0.3861	2.590
Volume	litres (L)	gallons (gal)	0.26417	3.7854
	megalitres	million gallons (10^6 gal)	0.26417	3.7854
	cubic metres (m^3)	cubic feet (ft^3)	35.315	0.028317
	cubic metres (m^3)	cubic yards (yd^3)	1.308	0.76455
	cubic dekametres (dam^3)	acre-feet (ac-ft)	0.8107	1.2335
Flow	cubic metres per second (m^3/s)	cubic feet per second (ft^3/s)	35.315	0.028317
	litres per minute (L/min)	gallons per minute (gal/min)	0.26417	3.7854
	litres per day (L/day)	gallons per day (gal/day)	0.26417	3.7854
	megalitres per day (ML/day)	million gallons per day (mgd)	0.26417	3.7854
	cubic dekametres per day (dam^3/day)	acre-feet per day (ac-ft/day)	0.8107	1.2335
Mass	kilograms (kg)	pounds (lb)	2.2046	0.45359
	megagrams (Mg)	tons (short, 2,000 lb)	1.1023	0.90718
Velocity	metres per second (m/s)	feet per second (ft/s)	3.2808	0.3048
Power	kilowatts (kW)	horsepower (hp)	1.3405	0.746
Pressure	kilopascals (kPa)	pounds per square inch (psi)	0.14505	6.8948
	kilopascals (kPa)	feet head of water	0.33456	2.989
Specific Capacity	litres per minute per metre drawdown	gallons per minute per foot drawdown	0.08052	12.419
Concentration	milligrams per litre (mg/L)	parts per million (ppm)	1.0	1.0
Electrical Conductivity	microsiemens per centimetre (uS/cm)	micromhos per centimetre	1.0	1.0
Temperature	degrees Celsius (°C)	degrees Fahrenheit (°F)	(1.8 × °C)+32	(°F−32)/1.8